Faculty of Science and Engineering

Engagement of Citizens in e-Government, a Conceptual Framework Using Serious Gaming

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DEVELOPING A CONCEPTUAL FRAMEWORK TO IMPROVE CITIZENS' ENGAGEMENT WITH E-GOVERNMENT IN LIBYA BY THE USE OF SERIOUS GAMES

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Abstract

This study explores the challenge of low citizen engagement and participation in e-Government in terms of lack of knowledge, experience, trust in e-Services and government itself. The research addressed the issues of factors that influence citizens' acceptance and adoption of e-government services in Libya, how to overcome the barriers, and determine serious games can promote citizen usage. This study applied an integrated approach utilising the Technology Acceptance Model and Trustworthiness Model theoretical models in a focused framework of intention to use.

This research applied mixed research methodology, with exploratory sequential case study (quantitative) and qualitative investigation of the Libyan e-Government project and barriers to its implementation by semi-structured interviews. Furthermore, a quantitative survey questionnaire was used to validate the proposed framework, and a post-test questionnaire was also used to evaluate the effectiveness of the serious game.

A conceptual framework was developed for all factors that may affect users' intention to use e-Services and determine the adoption needs: the two main factors are e-Government adoption issues (including citizen trust in government, e-Services and the internet) and knowledge and experience. Using serious games is of a great value in learning and expanding knowledge, practicing and training, building self-confidence, and increasing security and privacy mechanisms. It would build trust between users and agencies by experiencing e-Services' reliability, dependability, efficiency and capability, thus promoting adoption and use.

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I wish to dedicate this work to my parents and my family

Publications

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List of Abbreviations

TAM: Technology Acceptance Model

TM: Trustworthiness Model

IU: Intention to Use

PEoU: Perceived Ease of Use

PU: Perceived Usefulness

InT: Internet Trust

GT: Government Trust

DoI: Diffusion of Innovation

1 Introduction

This chapter provides an overview of the research. The following section describes research background, followed by, problem statement section and research questions, then the proposed solution is discussed, followed by a section that defines the research aim and objectives. The subsequent section addresses the original contributions that this research provides to knowledge. To familiarise readers with the remaining chapters, the thesis outline is offered in the last section.

1.1 Background of the Study

Citizen engagement has been identified as one of the main factors in e-Government success (Cegarra-Navarro et al., 2012), and many projects failed due to a lack of citizen engagement, particularly in developing countries. This thesis briefly explores the benefits of serious games in team-based learning and training, aiming to apply them in the field of e-Government to reduce the risk of failure. The thesis achieves this exploration in three main ways. Firstly, by using a novel approach to establish the core elements of using serious games in e-Government could be used to increase citizens' motivation. Secondly, by developing a conceptual framework that applies the use of serious games to process and supports the fundamental external variables for both Technology Acceptance Model (TAM) which provide better explanation, prediction and increasing user acceptance of technology by tracing the influence of external variables on internal beliefs, attitudes and intentions. Trustworthiness Model (TM) which examines the impact that users' level of trust has on their intention to adopt technologies provided by government

agencies. It provides ability to achieve a high level of users' intention and actual citizens' participation and involvement in e-Government services. Finally, testing and validation of the proposed framework in the most realistic possible way by conducted a survey with a broad variety of citizens, in addition to developing a simple serious game prototype that aims to expand knowledge and practice of e-Services in an interactive way.

1.2 Problem Statement

With the rapid development of ICT in recent decades, various techniques of governance have been fundamentally altered along with sweeping changes in the state and private economic sectors (Ndou, 2004). Electronic governance (e-Government) provides governmental services through websites and portals with the capability of supporting and simplifying governance for all stakeholders, such as citizens, government agencies and employees (Hu et al., 2009). Nowadays, more governments globally are introducing e-Government as a means of increasing efficiency and effectiveness, developing better services for citizens and decreasing costs to the public sector (Fang, 2002; Mishrif and Selmanovic, 2010). One of the most common management opportunities has been e-Government, which been utilised to improve government performance in numerous cases, with varying degrees of success (Yang and Rho, 2007).

All governments aim to achieve the main goal of successful e-Government, a high level of citizen engagement (Cegarra-Navarro et al., 2012; Cegarra-Navarro et al., 2014), by utilising the IT channel enabling delivery of government services and better interaction with the public (Tung and Rieck,

2005). However, the transformation from the traditional to e-Government services has introduced more political, cultural, organisational and technical challenges to governments and other public service providers, because e-Government represents fundamental changes in the structure of the public sector, business and culture.

Therefore, the adoption of e-Government presents technological, organisational, political, cultural and social challenges that need to be considered and addressed carefully by any government contemplating its adoption, especially in developing countries. In confronting this challenge, the findings of several studies (Gauld et al., 2010; Nkohkwo and Islam, 2013; Oseni et al, 2015) indicate that one of the fundamental issues in the failure of e-Government implementation is the lack of public participation; in other words, citizen participation is one of the main factors in the success of e-Government (Alawneh et al., 2013). Despite e-Government offering a range of potential benefits both for governments and citizens, if the latter does not utilise e-Government systems then projects are unsuccessful.

It has been observed that e-Government failed in many countries due to having a techno-centric focus rather than a comprehensive approach encompassing the organisational, cultural and political dimensions. According to Heeks (2003), a growing number of scholars and analysts in this field agree that a major reason for this unsatisfactory outcome is the failure to see e-Government systems as socio-technical systems; in other words, they do not accommodate the needs of end users, i.e. the public; e-Government requires a high level of public participation, which is particularly elusive in developing

countries (Ebrahim and Irani, 2005). However, many e-Government projects have failed to achieve this goal, particularly in developing countries, due to a lack of knowledge regarding e-Government benefits, lack of (technological) confidence to use IT facilities among citizens (Heeks, 2003; Ahmed et al, 2013), low level of trust to use e-Services because of privacy and security threats, and a low level of trust in the government itself (Belanche et al., 2012; Nam, 2014; Fakhoury and Aubert, 2015).

To conclude, implementation of successful e-Government services in developing countries is facing several major barriers:

- Encouraging non-technical domain expert citizens with no or little IT and computer skills to participate in e-Services.
- Expanding users' knowledge regarding e-Government benefits.
- Increasing the level of confidence and trust to use e-Services and to reduce actual privacy and security threats.

1.3 Developing a Framework

This study makes an original contribution to knowledge by proposing serious games as a tool to address the three research problems identified above. Serious games technologies have been used successfully in different fields such as education, training, medical, commercial, military and safety management (Poplin, 2012; Ahmed et al., 2014). Knight et al. (2010) mentioned that serious gaming technology can be applied to teach major incident triage, and it has been found to improve the accuracy of the triage process when this process is assessed immediately after training, suggesting that serious gaming may have a role to play in the future if these promising

early results are maintained over the long term (Mayer, 2012). Therefore, with the growing attention and use of the gaming industry for non-entertainment purposes, serious games and game-based learning technologies have brought undeniable benefits to all fields in which they have been deployed (Connolly et al., 2012). Serious games have been defined as functional video games designed to promote understanding of concepts (education), improve user skills (training), conform to the environment (treatment of phobias), or deliver a message (e.g. promotion, advertising, ideological messages), also known as political games (Mouaheb et al., 2012). Consequently, it is clearly necessary to understand how the use of serious games affects, benefits and improves the quality of e-Services.

To assist in addressing the first barrier, encouraging non-technical domain IT experts to participate in e-Services, serious game-based learning would certainly provide an opportunity to increase users' knowledge regarding computer and IT features. The second barrier, expanding users' knowledge regarding e-Government benefits, is addressed by practicing the e-Government services within a game, giving the user a valuable experience with all advantages of e-Services in terms of efficiency, availability and time-saving. To address the third barrier, lack of trust in e-Services among citizens, serious games offers a credible improvement regarding trust in e-Government by allowing the user to understand the level of privacy and security that the government personnel apply to the system.

1.4 Research Questions

The impact of the citizens' engagement on the success of e-government systems is significant. Apart from the user acceptance, impact of lack of knowledge and experience among users and trust in their government should be investigated. Hence, this research aims to answer the following research questions:

1. How to develop a framework that can be used as conceptual guidance in increasing citizen' participation with e-government in developing countries?

   To answer this question, the following sub-questions need to be addressed:

1.1 What factors that influence the citizens' acceptance and adoption of e-government services in Libya?

1.2 How to overcome the barriers of successful adoption of e-Government in Libya?

1.3 To what extent the use of serious games can be effective in developing citizens' adoption of e-Government?

1.5 Research Aim

In developing countries, ICT plays a significant role in offering beneficial capability developments and determining success on the world stage (Ogunsola, 2005). Individual governments and organisations that do not adopt ICT will find themselves at a critical disadvantage. On the other hand, a major problem in e-Government projects is a lack of citizen engagement and

participation, particularly in developing countries, with a lack of knowledge and experience in addition to the lack of trust in e-Services and government.

Hence, this study is of major importance to developing nations as it seeks to focus on e-Government in terms of socio-technical systems; in other words, to accommodate the needs of end users, e-Government requires a high level of public participation. This research seeks to develop a conceptual framework that applies the use of serious games to process and supports the fundamental external variables for both TAM and TM for achieving a high level of users' intention and actual citizens' participation and involvement in e-Government services.

- The main aim of this research is to propose a conceptual framework that reveals a general support for serious games in the determinant of more citizen engagement, which promotes achieving effective e-Government.

1.6 Research objectives

Based on the research aim and research questions above, the objectives of this research are as follows:

1. Fill the gap in knowledge on the determinants of success/failure of the implementation of e-Government services and applications in the study context of Libya.
2. Identify attributes of serious games that support effective learning to expanding user knowledge and discovering services benefits.

3. Develop a conceptual framework that would aid governments and organisations that attempt to implement e-Services through understanding all factors that may affect users' Intention to Use (IU) e-Services and determine the adoption needs.
4. Evaluate the proposed framework from users' point of view in a case of Libya.

1.7 Significance of the Thesis

This thesis provides significant original contributions to knowledge in two areas. It offers insights into the application of serious games, providing a new rationale for their use in learning and training, and provides an understanding of the characteristics that facilitate motivation and engagement, as well as evidence of the effectiveness of different game use. Second, this research has produced serious game as tool, in terms of application. It produced a framework to support the adoption of e-Government through improving citizens' intention to engage and participate. More specifically, this thesis provides insights into the nature of citizen motivation to the actual use of e-Services, both for government and for public, and provides evidence that there is a link between a motivation to use the system and trust in both internet and government agents. This work also provides a conceptual framework based on theoretical studies applies the use of serious games to process and supports the fundamental external variables for both TAM and trustworthiness for achieving a high level of users' intention and actual citizens' participation and involvement in e-Government services.

This thesis contributes to the growing body of research on e-Government and serious games by providing an academic foundation for continued investigation in these areas.

1.8 Research Activities

To achieve the research objectives presented above, this study starts with preliminary research investigating the status and prospects of e-Government in Libya, with reference to a comprehensive review of the literature of e-Government in developed and developing nations, and factors in e-Government success. Moreover, literature on serious games is reviewed to explore its advantages and how it could be used to address the shortcomings of existing e-Government adoption strategies and tools.

Models of using serious games in e-Government in developing countries are explored followed by developing a conceptual framework to improve the level citizens' willingness of using e-Government in Libya. The framework was validated by surveying a broad and diverse sample of Libyan citizens at a community event in Libya. In addition, a serious game was developed to test the proposed framework. All collected data was analysed and the results are discussed in chapter 8.

1.9 Thesis Outline

This thesis comprises nine chapters. This section provides an overview of the contents of each chapter and how it fits into the overall research activity, as described in the previous section.

This initial chapter provides an overview of the influences on the research, describes the research questions explored, and the research activities undertaken.

Chapter 2 critically reviews existing literature in three areas: e-Government, TAM and TM, and serious games. The first section on e-Government describes the categories and use of e-Government, benefits and challenges, implementation and development of e-Government, comparing e-Government in developed and developing countries.

The second section reviews technology adoption models and their use in different fields, principally in e-Services, followed by a review of the use of serious games technology and the advantages of games-based learning and training.

The final section hones in on e-Government in Libya, providing background about Libyan education, telecommunications and internet usage as well as challenges and opportunities that the project is facing.

Chapter 3 describes the research design and methodology that underpins this thesis and provides an overview of the range of research methodologies used in this research and how their choice was influenced by the epistemological standpoint of the researcher, including all methods and data collection and analysis.

Chapter 4 presents the conceptual framework. It begins by introducing serious games in e-Services, followed by proposing a model of using serious games in e-Government in developing countries, and it provides an overview of

serious games for effective e-Government service. The conceptual framework for improving citizens' motivation to use e-Government is presented.

Chapter 5 discusses the development of the hypotheses and questionnaire related to the dimensions perceived ease of use, perceived usefulness, internet trust and government trust. Moreover, questionnaire structure and development, as well as measurement instrument development, are included.

Chapter 6 presents the validation of the framework. The first part discusses the outcomes of the qualitative study conducted to formalised the research problem, followed by discussion of the survey-based study conducted to test the hypotheses described in the previous chapter.

Chapter 7 discusses a serious game prototype developed to test how the framework fulfils the needs of citizens in order to be encouraged to use e-Services.

Chapter 8 presents the findings and discussion of interview outcomes, survey and the result of hypotheses testing, and the results of using the game prototype. It identifies the benefits of this study in terms of an e-Government project in Libya, and it highlights the limitations of this research and considers future directions.

Chapter 9 presents the conclusion of the thesis by evaluating and discussing the findings of all chapters, particularly considering the implications for the use of serious games in e-Government context. This chapter also provides a reflective critique of the research methodology employed, summarises the contribution arising from this work to knowledge.

In its entirety, this thesis presents an overview of the field of improving public intention to participate in e-Government services and describes serious games as a tool to achieve this goal, and a range of research activities undertaken with the aim of developing the proposed framework and its validation. The final analysis attempts to test how this framework addresses the overarching research goal including framework to gain a better understanding of how serious games can be used most effectively to empower citizen engagement.

1.10 Summary

This chapter presents the research background and explained the research problem, proposed solution, aim and objectives, the main research questions to be answered. Furthermore, the chapter reveals the importance of the research topic and the way it contributes to knowledge. The subsequent chapters describe the practical implementation of what has been previously detailed in the thesis outline. The next chapter is the literature review on the topics relevant to the research.

2 E-Government, with Serious Games and Applicability to Emerging Markets

2.1 Introduction

This chapter critically reviews comprehensive literature pertaining to e-Government, e-Government acceptance and adoption models, serious games and the use of ICT and e-Government in Libya.

The first part starts with a general overview of the concept of e-Government, a review of e-Government services categories is provided, its advantages and shortages are discussed to establish the main issues that surround e-Government systems and to provide a clear view of e-Government success. This part illustrates e-Government concepts, definitions, information systems adoption and success with the focus on e-Government systems in developing countries. This enabled the researcher to attain a good understanding of the current research on e-Government systems to address the key issues of e-Government success.

It then discusses e-Government acceptance and provides information about technology adoption models and e-Government adoption studies, followed by introducing the literature on user acceptance of e-Services divided into studies that discuss issues related to e-Government initiatives/projects success, and those that discuss user satisfaction. In this part, TAM and TM are also reviewed and related to the research objectives.

The next part reviews serious games literature, starting with the concept of serious games and defining their differentiation from entertainment games.

The benefits of use serious games in other fields and games-based learning and training are explained, and game design literature is reviewed to determine the optimum strategy to adopt serious games technology in an e-Government context.

Finally, the chapter reviews Libyan e-Government with attention to IT infrastructure, while noting the opportunities and challenges that e-Government faces in the Libyan context.

2.2 E-Government Overview

E-Government has become a popular concept in public administration ICT strategies to create a networked structure for interconnectivity and service delivery (Bekkers and Zouridis, 1999; Aldrich, Bertot and McClure, 2002), with particular emphasis of its virtues of efficiency, effectiveness, interactivity, transparency, accountability and decentralisation (Chavan and Rathod, 2009). However, despite actual widespread adoption, e-Government remains only vaguely defined and little understood (Halchin, 2004).

One of the most popular definitions is of e-Government is “utilising the Internet and the World-Wide-Web for delivering government information and services to citizens” (Ronaghan, 2002). This may be combined with the use of other ICTs, such as “database, networking, discussion support, multimedia, automation, tracking and tracing, and personal identification technologies” (Jaeger, 2003). Others define e-Government as the relationships between governments, their customers (businesses, other governments, and citizens), and their suppliers (again, businesses, other governments, and citizens) by the use of electronic means (Means and Schneider, 2000). As Yong (2007)

notes: “e-Government is simply using information technology to deliver government services directly to the customer 24/7. The customer can be a citizen, a business or even another government entity”. Furthermore, some define e-Government as the use of technology, especially Web-based applications, to enhance access to and efficiently deliver government information and services (Brown and Brudney, 2001).

E-Government can be categorised into four groups as follows; Government-to-Government (G2G), Government-to-Citizen (G2C), Government-to-Business (G2B), and Government-to-Employee (G2E) (Chavan and Rathod, 2009).

G2G is known as e-Administration, which applies communication, coordination, and standardisation of information and services by using a common data warehouse. G2C is known as e-Government applied to enhance communication, transparency, accountability, effectiveness, efficiency, standardisation of information and services, productivity such as government organisations, websites, email communication between the citizens and government officials. G2B is referred to as e-Government, e-Commerce or e-Collaboration and it applies to communication, collaboration and commerce, for example posting government bids on the Web, e-Procurement and e-Partnerships. Lastly, G2E is concerned with the relationship between the government and its employees, called e-Management, which pertains to communication, coordination, and integration of employees and back office systems for example e-Learning. Some researchers argue that G2E is still part of G2C (Chavan and Rathod, 2009).

E-Government is also perceived differently in connection with its theoretical background. There are four theoretical frameworks within which e-Government is conceptualised. The first framework involves the potential of IT in decentralisation and democratisation. The second normative/dystopian framework underlines the limitations and contradictions of technology. Third, the socio-technical systems approach emphasises the continuous and two-way interaction of the technology and the organisational–institutional environment. The fourth framework places e-Government within theories of global integration (Chavan and Rathod, 2009).

However, merely understanding categories of e-Government or differentiated relationships in e-Government provides only a static perspective. There is a need to evaluate e-Government in a dynamic context and understand its benefits (and challenges) accruing over time.

2.2.1 E-Government Implementation

The transformation from traditional government to e-Government services is complex, touching the political, cultural, organisational and technical aspects of everything that the government and other public service providers do. In dealing with this challenge, governments need to integrate work systems, processes, development and welfare into a very strong performance management system that employees can use effectively (Mishrif and Selmanovic, 2010).

The underperformance of the Middle East and North African (MENA) countries to achieve reasonable levels of social and economic growth has put their governments under increasing pressure to reform their public institutions

and increase their efficiency and effectiveness in delivering public goods (Mishrif and Selmanovic, 2010). E-Government is relatively new in the MENA region, whose governments have recently realised that their social and economic development depends on good governance practices. Such a realisation has been translated into actions, with most national reform strategies now focusing on the initiation and implementation of e-Government and other e-Tools to improve public sector performance and increase administrative efficiency (Mishrif and Selmanovic, 2010).

Successful implementation of e-Governance solutions is built on efficient, accountable and transparent G2G and G2S transactions (Zarei et al., 2008). Many countries have attempted to implement e-Government as the most fundamental infrastructure for such programmes. Various famous models have been developed to implement these ideas, but such models may not be applicable in developing countries since their technical and non-technical infrastructures are not as mature as those of developed countries (Zarei et al., 2008).

Although well-known e-Government development models (EGDMs, as described in detail below) are commonly used in many developed countries, they are not convincing as absolute guidelines for e-Government progress in developing countries. It seems that these models are more appropriate for developed countries that have up-to-date technology, as well as non-technical, intangible parameters such as concentration on public awareness and e-Readiness. Motivations towards e-Government implementation are essentially different in developing countries. There are fundamental

differences in the technical, social and political factors of various countries, which demands more customised local models. It seems that different countries should identify major activities required for the development of their national e-Government, and then incorporate them into the model, usually called the national e-Government development model. It is recommended that countries perform a general analysis and assessment of their condition pertaining to weaknesses, strengths, threats, and opportunities before implementation of e-Government (Zarei et al., 2008).

2.2.2 E-Government Development Models

Development is the process through which organisations develop the internal capacity to be more effective. Inspired by Riley's (2007) definition of organisation development, e-Government development can be seen as a complex strategy intended to change the beliefs, attitudes, values and structure of governments so that they can better adapt to information technologies, markets and challenges. Development of an e-Government model is seen as a unique system of systems (SOS) represented in a generic model, usually called the e-Government development model (EGDM). This section introduces some well-known EGDMs.

- *The UN Web Presence Measurement Model*

According to a National Audit Office (NAO, 2002) report entitled *Government on the Web*, e-Government is mainly seen as a work in progress with five basic stages of development. These stages start from the basic site stage, which provides electronic versions of printed documents for public consumption. Stage two is the e-Publishing stage, wherein citizens or

businesses can download forms to fill in and post back. The interactive stage is the third stage that allows citizens have basic interaction with the government agencies. Besides hosting search engines on the sites for easy navigation, stage four is the transactional stage where direct interaction is carried out, such as making secure payments. Finally, the transformation stage is achieved when the public sector websites facilitate a one-stop shop initiative as an integrated platform for government services and organisations, to provide total transparency of citizens and businesses (UN, 2002).

- *Gartner four-stage model*

Gartner demonstrates the progress of e-Government in four stages. First, immediate action is initiated toward the creation of a virtual environment on the Internet in the *Presence* stage, in order to provide the public with access to information. The *Interaction* stage refers to providing a website with search ability, and to providing the public with access to various forms and sites. *Transaction* involves the online execution of public services, such as the payment of accounts balances and receiving licenses. Finally, the *Transformation* stage is seen at the regional and national levels, consisting of integration amongst internal and external applications, in order to provide full communication between the governmental offices and non-governmental organisations (Baum and Di Maio, 2000).

- *Layne and Lee's Four-Stage Model*

Layne and Lee (2001) posited e-Government development according to a four-stage model, as shown in Figure 2.1. In the first stage, the development of government websites that publish government information online is the

main goal. The second stage introduces interfaces that allow users to transact with government through online systems, known as the ‘transition-stage’ of e-Government, wherein the government makes live database links to their websites. Layne and Lee (2001) named stages three and four as vertical and horizontal integration. Vertical integration refers to the connection between local states and national or federal governments for different government services. For instance, when a citizen is issued a business license by the local government, this information is transferred to the central government’s business licensing system to obtain an employer unique identification number. Horizontal integration refers to connections across different agencies and services providers at the same level of government.

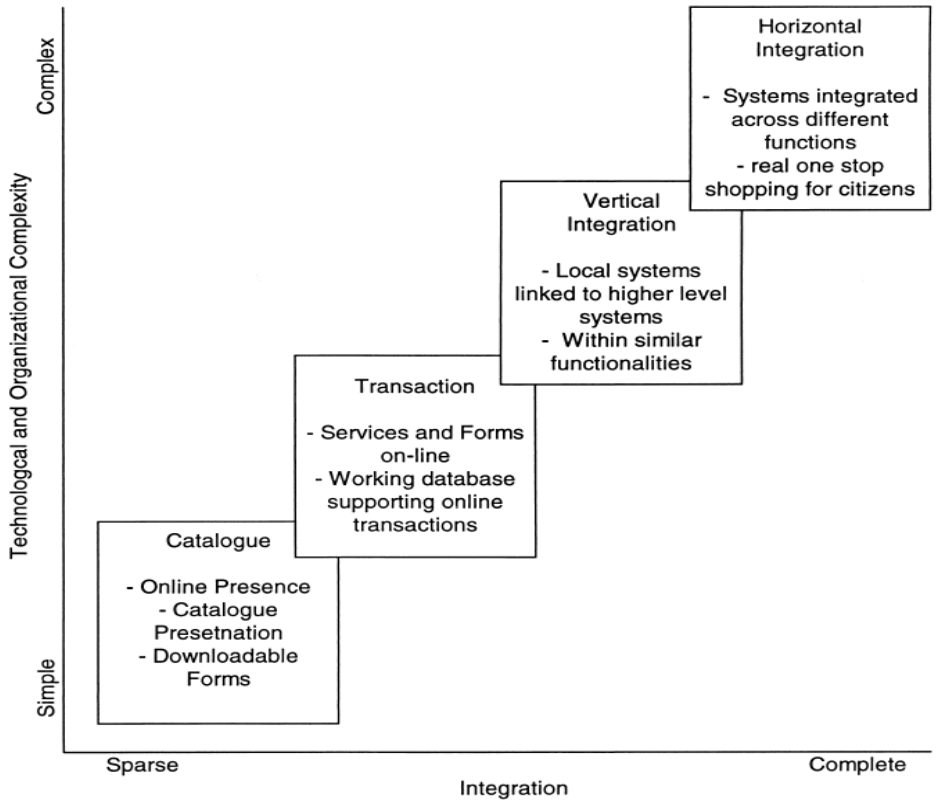

Figure 2.1: Dimensions and stages of e-Government development

(Layne and Lee 2001, p.124)

- *Other models*

Believing that the main e-Government objectives are to serve and to build long-term relationships with citizens, Deloitte and Touche (2001) proposed a six-stage model, including information publishing/dissemination, official two-way transaction, multi-purpose portals, portal personalisation, clustering of common services, and full integration and enterprise transaction.

2.2.3 E-Government Adoption

E-Government services adoption has received wide attention, since significant variation in the functionality and domain of e-Government services is provided in different countries. E-Government projects are challenging for government agencies to design, build, implement and maintain, and they mainly rely on ICT components that require a complex process of designing and re-engineering strategies. The literature (Kamal, 2004; Siau and Long, 2005; Chavan and Rathod, 2009) has proposed number of factors that influence the success of adoption process of e-Government, grouped into four areas: organisation, technology, environment and executive.

The key factors were divided into four categories of organisational, technological, environmental and executive.

- *Organisational Factors*

Organisational factors that influence the adoption process of e-Government can be summarised as follows:

Formalisation: This refers to the existence of clear procedures, norms and formal processes for carrying out organisational tasks (Chavan and Rathod, 2009).

Centralisation: This refers to the level of power or decision-making authority in an organisation and encompasses participation in decision-making and the organisation's management hierarchy (Siau and Long, 2005).

Organisational Cost: This refers to the financial resources available to fund e-Government projects, including staff training, consultancy, implementation of any subsequent applications and tools, maintenance and management costs (Siau and Long, 2005).

Organisational Size: This refers to the size of an organisation that reflects two characteristics: the volume of services directly provided to citizens and businesses, and the capacity of the government information-processing environment (Chavan and Rathod, 2009).

- *Technological Factors*

Implementation of e-Government requires a substantial degree of technical competence through maintaining ICTs, integrating distributed systems and providing the necessary applications to ensure smooth and efficient adoption. The three key issues have been explained by (Kim and Lee, 2004) as follows:

IT Infrastructure: This is the combination of software and hardware available within an organisation that provides secure electronic services for processes within the organisation and enables internet-based business.

IT Capability: This refers to the level and quality of IT resources, personnel IT knowledge and IT sophistication of an organisation.

IT Expertise: This factor can be measured according to the training strategy of an organisation and the availability of qualified IT staff.

- *Environmental Factors*

Environmental factors are external to any single organisation, and can be divided into four components (Kamal, 2004):

External Pressure: Increased competition often motivates organisations to search for new ways to increase their efficiency and seek a viable advantage.

Public Size: This refers to the number of services provided and the size of the population served. In central and local governments, size has been noticed to have a positive effect on IT innovation adoption.

User Readiness: This factor is related to user (i.e. citizens, businesses and government) willingness and internet penetration. Consumer willingness reflects the extent to which users accept online services, interactions and transactions.

Market Knowledge: The majority of successful innovations are dependent on the recognition of public/user demand.

- *Executive Factors*

Executive factors have the potential to influence the development of e-Government. According to Kamal (2004), there are three primary elements to be identified within this area:

Management Style: The adoption of e-Government has becomes a significant strategic action plan for the public sector because it is fundamental to modernising government business processes, and many IT executives believe that e-Government adoption will increase effectiveness and save money through expanding centralisation of resources and economies of scale.

Managerial Capability: This can be defined as the ability to examine and identify problems within existing systems as well as to develop and assess options for improving the IT abilities of the organisation.

Administrative Authority: This can be enhanced through IT innovation when the political environment, encouraged by the management level, favours modifications.

2.3 Benefits

The use of e-Government initiatives has important benefits for the delivery of more efficient and effective information and service provision. According to Buckley (2003), the major benefits can be categorised into improved delivery of public services (in terms of availability, ease of use and cost saving to citizens, businesses and government agencies); improved accountability, democracy and transparency; and economic and service satisfaction benefits for the community as a whole. The advantages of using e-Government applications are the same for both developed and developing countries, and are generally understood with regard to three stakeholder groups: government, citizens and businesses (Nadu, 2004).

Benefits for government include improved efficiency across government agencies, increasing public participation, and data issues of fast recovery, storage and assets, which foster better management methods and developing relationships amongst the government and community.

Benefits for citizens generally include obtaining convenient 24/7 government services, getting fast and efficient electronic service, improving equality and

capability of access, developing good relationships between government and citizens.

Benefits for businesses include reduced time required to conduct operations, a more convenient and transparent means of interaction with government, increasing empowerment of businesses through access to information, knowledge and services and improving the business environment generally (Nadu, 2004).

2.4 Limitations

As a relatively new ICT solution, it is easy to pinpoint the potential advantages of e-Government; however, it does have significant limitations and barriers that must be recognised if any e-Government project is to have the possibility of success (Riley, 2007). The concept of e-Government is limited in six different ways. The first limitation is related to the standard definition of what e-Government is, as it is difficult to classify succinctly; in effect this pertains to the vision of what it is hoped the e-Government project will achieve rather than a linguistic problem. The e-Government concept is defined by the objectives underlying certain actions rather than by sources of information or service, the particular technology used or by activities of the players involved (Chavan and Rathod, 2009).

A more prosaic limitation is that e-Government is costly, requiring a huge investment in ICT infrastructure, human resources and equipment, all predicated on a large budget (Riley, 2007). Third, e-Government requires IT literacy among citizens, because the use of e-Government requires a certain functional level of IT knowledge and skills on the part of clients (Riley, 2007),

so the government has to allocate money, time and energy to the training of stakeholders in order to meet the minimum requirements of e-Government regarding ICT capacity. Lastly, e-Government requires time to design and implement IT infrastructures, in addition to its general requirements for manpower and equipment across the government sector (Misra, 2007).

Nevertheless, providing information is not enough; it is crucial that this delivery should satisfy the needs of users. Furthermore, users themselves need time to adjust and familiarise themselves with an e-Government project. Therefore, the government should implement e-Government gradually, planning an appropriate time frame in the management plan, which must take advantage of the benefits and address the various limitations of e-Government. This implementation is driven by public administration.

2.5 Challenges to e-Government Implementation

E-Government implementation is not simply transferring a successful system from one state to another, especially from developed to developing countries, since further efforts are necessary for the latter (Nkohkwo and Islam, 2013). Marche and McNiven (2003) suggested that practices and cultures are an important cause of the unsuccessful e-Government implementation. Many barriers are associated with adoption of e-Government, including issues of citizen confidence, privacy and security, citizens' appropriate skills and the acceptance of e-Government to replace traditional government (Aladwani, 2016). In addition, the digital divide issue in society is also a barrier against e-Government success in developing nations. As the primary user of e-Government services, citizens, play a fundamental role in success of e-

Government (Davison, Wagner and Ma, 2005; Venkatesh et al., 2014), public usage of e-Government services is paramount to success.

Table 2.1 presents previous studies that focused on the effective factors that influence the e-Government success beside technological factors. These factors reflect complexity of e-Government implementation. Some of those studies have examined issues such as decision makers' attitude and political pressures, organisational and management, legal and regulatory, institutional and environmental dimensions. However, few research have examined citizens' perceptions on e-Government use (Gauld, Goldfinch and Horsburgh, 2010; Rana et al., 2015).

This represents a significant gap in e-Government research that needs to be filled to cover citizens' Intention to Use (IU) and building citizens' confidence in both government and technology. In some cases, e-Government experience cites user failure as a reason for citizens rejecting using the system, in spite of the systems being well presented in terms of technological and project development (Goldfinch, 2007). Hence, this research attempts to fill this gap and proposes a conceptual framework for a better understanding of e-Government in the developing world, as investigated in the following section.

Table 2.1: Previous research on e-Government success factors

Adapted and expanded from Gil-Garcia and Pardo (2005)

Category	Factors	Authors
Information and data	Information and data quality	Dawes (1996); Redman (1998); Ballou and Tayi (1999); Burbridge (2002); Prybutok, Zhang, and Ryan (2008)
	Dynamic information needs	Brown and Brudney (2003)
	Usability	Davis (1989); Mahler and Regan (2002)
	Security issues	Moon (2002); Holden, Norris, and Fletcher (2003); Roy (2003)
	Technological incapability	Dawes (1996); Chengalur-Smith and Duchessi (1999); Brown (2001); Burbridge (2002); Holden, Norris, and Fletcher (2003)
	Technology complexity	Chengalur-Smith and Duchessi (1999); West and Berman (2001)
	Technical skills and experience	Brown (2001); Ho (2002); Moon (2002); Holden, Norris, and Fletcher (2003)
	Technology newness	Ho (2002); Roy (2003)
Organisational and management	Manager's attitudes and behaviour	Heintze and Bretschneider (2000); Gagnon (2001); Prybutok, Zhang, and Ryan (2008); Luk (2009)
	Users or organisational diversity	McFarlan (1981); Brown and Brudney (2003); Roy (2003
	Multiple or conflicting goals	Brown (2003); Kim and Kim (2003)
	Resistance to change	Burbridge (2002); Ho (2002); Edmiston (2003)
	Turf and conflicts	Barki, Rivard, and Talbot (1993); Dawes (1996); Burbridge (2002); Edmiston (2003); Roy (2003)
	Autonomy of agencies	Dawes (1996); Landsbergen Jr. And Wolken Jr. (2001)
Legal and regulatory	Restrictive laws and regulations	Chengalur-Smith and Duchessi (1999); Mahler and Regan (2002)
	Intergovernmental relationships	Landsbergen Jr. and Wolken Jr (2001); Burbridge (2002); Rocheleau (2000); Luk (2009)
	Policy and political pressures	Heintze and Bretschneider (2000); Mahler and Regan (2002); Brown and Brudney (2003); Roy (2003)
Institutional and environmental	Privacy concerns	Moon (2002); Edmiston (2003); Holden, Norris, and Fletcher (2003)
	Environmental context (social, economic, demographic)	La Porte, Demchak, and Jong (2002); Warkentin et al. (2002); Vathanopas, Krittayaphongphun, and Klomsiri (2008); Gauld, Goldfinch, and Horsburgh (2010)

2.6 E-Government in Developing Countries

A more recent study using UN empirical data found that e-Government development and implementation differ in three areas: income level, development status and region (UN, 2014). However, due to substantial

differences in many key aspects of e-Government related technological and social conditions between developed and developing countries, e-Government development strategies and experiences from developed countries may not be directly applicable to developing countries (Chen et al., 2006). To better understand the differences between developed and developing countries, five areas should be discussed:

- Infrastructure

Developed countries have good current infrastructure and high internet access for employees and citizens, whereas developing countries lag behind, with generally poor infrastructure and low Internet access for employees and citizens.

- Technical Staff

Developed countries need to increase the technical abilities of staff and hire younger professionals. They also need to acquire outsourcing abilities and outsource financial resources; current staff would be able to define requirements for development. However, developing countries do not have staff, or have very limited in-house staff and do not have local outsourcing abilities. They also rarely have the financial ability to outsource; current staff may be unable to define specific requirements.

- Citizens

High internet access and computer literacy in a context of digital and privacy safeguards in more experienced democratic systems are primed for active citizen participation in e-Government, and even governmental policy-making processes. Conversely, developing countries are characterised by citizens

inherently mistrusting of the state, and are reluctant to trust online services (including e-Commerce). Such countries often have low internet access (particularly in remote areas) and even citizens who know how to operate computers are relatively less experienced in democratic systems and exhibit less active participation in governmental policy-making processes.

- Digital divide

Unequal access and ICT usage, which is known as a digital divide, between developed and developing nations has been identified as one of the major obstacles to the implementation of e-government system (Rahman, 2014). All of the indicators of UN data convince us that there is a wide divide among countries. Since, the disparity in use of Internet between developed and developing in 2014, 94% citizens of Sweden have access to internet, while in Somalia, only 1% of its citizens connected to internet (UN 2014).

- History and Culture

Developing countries are generally associated with consistent economic growth and increasing productivity, high standards of living and a relatively long history of democracy and transparent government, while the converse is often the case in developing countries.

2.7 E-Government Acceptance

E-Government literature can be divided into discussion of e-Government initiatives/projects success issues, and e-Government systems adoption and success such as e-Government portals and mobile government (m-Government). Many researchers have investigated the various barriers that affect e-Government implementation. Seng et al. (2010) examined the

influence of cultural factors on Malaysia's e-Government and raised the importance of cultural barriers/enablers in e-Government implementation, while Weerakkody et al. (2012) provided a comparative study of e-Government implementation strategies between the UK and Slovakia. Al Nagi and Hamdan (2009) conducted a study to investigate Jordanian e-Government readiness. The literature proposed various models as evaluation of e-Government initiatives' success, such as the United Nations (Rorissa et al., 2011), Accenture (Rorissa et al., 2011), and Brown University (Fu et al., 2006).

In understanding the successful adoption of e-Government services, some studies focussed on understanding e-Government services' success in terms of apparent compatibility, observability and complexity (Zafiropoulos et al., 2012; Alateyahet et al. 2013), while others focused on the actual adoption of e-Government (Ebrahim and Irani, 2005; Shareef et al., 2011; Alawneh et al., 2013).

2.8 Information System Adoption Models

A wide range of studies focused on the new information technology acceptance in various contexts, TAM and the Diffusion of Innovation (DoI) models (Taylor and Todd, 1995; Harrison et al., 1997; Hernandez and Mazzon, 2007). TAM is an intention-based model originally developed from social psychology and applied to understand IT usage (Taylor and Todd, 1995; Harrison et al., 1997). The DoI perspective considers more organisational aspects of technology adoption, and it has been widely used in

the context of e-Government (Taylor and Todd, 1995; Carter and Bélanger, 2005; Shareef et al., 2009).

2.8.1 Application of Technology Acceptance Model

Since the initial development of the TAM by Davis (1985) it has been widely utilised to examine users' acceptance of technology, particularly to evaluate e-Commerce adoption (Al-Adawi et al., 2005; Carter and Bélanger, 2005; Jaeger and Matteson, 2009; Suki and Ramayah, 2010; Farahat, 2012; Zafiropoulos et al., 2012; Alawneh et al., 2013; Susanto and Goodwin, 2013). TAM posits that three key factors explain user motivation, as explained previously perceived ease of use (PEoU), perceived usefulness (PU) and attitude toward using the system (Davis, 1989). Davis and Venkatesh (1996) improved and modified the finalised form of TAM after numerous stages of development (Chuttur, 2009). As shown in Figure 2.2, TAM affirms that user acceptance or rejection of the system fundamentally determines the attitude toward use and thus the extent of actual use. The attitude of the user is mainly influenced by PEoU and PU, both of which are more positive if the technology is actually easier to use.

PEoU was defined as "as the degree to which a person believes that using a particular system would be free of effort, and PU defined as the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). These constructs, which may be representative of objective reality, reflect users' subjective assessments of a system. If users understand a system as useful and easy to use, it is more likely that the system will be accepted (Davis, 1989). However, external

variables such as system characteristics, user participation in design, user training and the implementation process have a direct impact on both PU and PEoU (Davis and Venkatesh, 1996). Hence, in the context of IT adoption and acceptance, a large volume of literature has explored TAM, and it is described as the standard model of IT acceptance/adoption by Gefen et al. (2003) and Ozkan and Kanat (2011). Moreover, (Cheng, 2011), said that TAM “is one of the most widely accepted and applied models in a variety of domains that include related IS and IT acceptance/adoption studies”. According to Hu et al. (1999), “compared with other frameworks/models, TAM has advantages in parsimony, IT specificity, strong theoretical basis, and ample empirical support”. Ozkan and Kanat (2011) stated that “our review of the literature on e-Government adoption revealed that TAM was the model that was utilised most often in the literature".

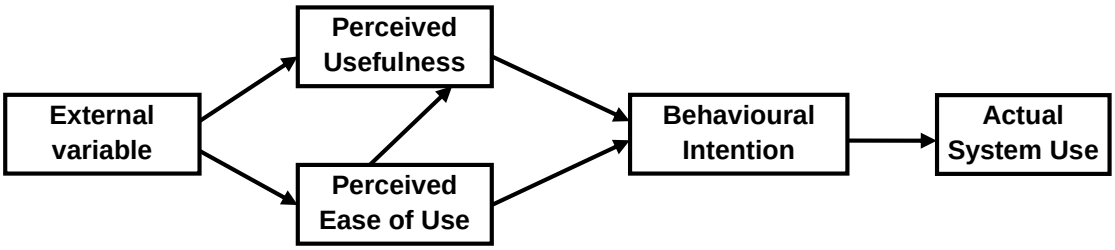

Figure 2.2: Technology Acceptance Model (Davis, 1989)

2.9 Trust in e-Government

E-Services are not just an IT portal, and many complex user and system factors are involved in e-Transactions (Teo and Liu, 2006). Gefen, Karahanna and Straub (2003) noted that trust is an important factor in retaining e-Service users, which they recommended fostering by establishing and improving an interactive multisession. Moreover, e-Commerce literature has identified trust

to be one of the fundamental elements of e-commerce transactions (Pennington, Wilcox, and Grover, 2003; Pavlou and Gefen, 2004; Gefen, Benbasat and Pavlou, 2008). In an e-Government context, trust plays an even more central role in the usage of government websites and e-Services (Warkentin et al., 2002; Teo, Srivastava and Jiang, 2009). A lack of trust in e-Government systems (and by implication, governments) fundamentally prevents their usage by intended users, regardless of the technical and user-friendly characteristics of the system.

Therefore, successful e-Government implementation highly depends on building citizen trust. Trust in e-Government in many previous studies is considered as the belief that the e-Government can deliver the required outcome satisfactorily (Teo, Srivastava and Jiang, 2009). However, developing nations generally have a dearth of such trust in government, and in online transactions per se; Alateyahet et al. (2013) noted much greater concern about privacy and security issues associated with using new technologies in developing countries, apart from the widespread lack of trust in government itself (Carter and Bélanger, 2005).

2.9.1 Application of Trustworthiness Model

In addition to ease of use, user perceptions of the trustworthiness of e-Government services also strongly affect their intention to use, particularly in developing countries, referring both to trust in government and the channels by which services are delivered. The TM shown in Figure 2.3 has been used to examine the impact that users' level of trust has on their intention to adopt technologies provided by government agencies (Gefen and Reychav, 2014;

Fakhoury and Aubert, 2015). Trustworthiness has been defined as “the perception of confidence in the electronic marketer’s reliability and integrity” (Belanger et al., 2002), although as explained previously trust in government itself is an additional fundamental concern in developing countries in terms of e-Government adoption.

The undeniable challenges facing government and private agencies interested in e-Commerce and e-Government are privacy and security issues. A multidimensional model of trust in e-Commerce focusing on users’ initial trust in a web vendor described initial trust as “trust in an unfamiliar trustee, a relationship in which the actors do not yet have credible, meaningful information about, or affective bonds with, each other” (McKnight et al. 2002). In initial relationships, “people use whatever information they have, such as perceptions of a website, to make trust inferences” (McKnight et al. 2002). As defined by Lee and Turban (2001), the behaviour of adopting and using e-Government services requires users’ trust in both the technological medium (i.e. the internet) through which electronic transactions are executed, the service (e.g. governmental) provided, and the service provider (government itself, or a third-party private partner). Interrelated with these dimensions, cultural, political and experience variables have direct impacts on trust in government, whereas knowledge and experience directly influence trust in the Internet.

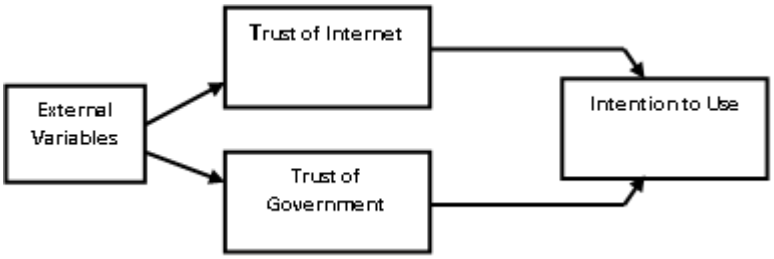

Figure 2.3: Trustworthiness Model

According to Heeks (2003), a growing number of scholars and analysts in the field agree that a major reason for e-Government's unsatisfactory outcomes is the failure to see e-Government systems as socio-technical systems; in other words, they do not accommodate the needs of end users, i.e. the public – e-Government requires a high level of public participation, which is particularly elusive in developing countries (Ebrahim and Irani, 2005). Many e-Government projects have failed due to a lack of knowledge among users regarding e-Government benefits, shortage of confidence to use IT facilities among citizens (Heeks, 2003; Ahmed et al., 2013), low level of trust to use e-Services because of privacy and security threats, and a low level of trust in the government itself (Belanche et al., 2012; Nam, 2014; Fakhoury and Aubert, 2015).

On the other hand, serious games technologies have been used successfully in different fields such as education, training, medical, commercial, military and safety management (Knight et al., 2010; Poplin, 2012; Ahmed et al., 2014). Therefore, this study explores the role of serious gaming in an e-Government context.

2.10 Serious Games

A serious game was defined by Djaouti et al. (2011) as a:

> *"Computer application, which aims to combine aspects of both serious, but not limited to serious, such as teaching, learning, communication, or further information with entertainment from the spring game. Such an association has intended to depart from mere entertainment" p, 8.*

According to Knight et al. (2010) and Poplin (2012), serious games are defined as video games, virtual environments and simulations that provide opportunities to be employed within a responsive scenario, gameplay or encounters, to inform and influence to promote well-being and experiences to express meaning. The success or quality of serious games is characterised by the degree to which their aims are achieved, and they involve no entertainment characteristics or varying degrees thereof, as suited to the learning needs (Guillén-Nieto and Aleson-Carbonell, 2012).

According to Laamarti et al. (2014), serious games target multiple learning objectives and the definitions associated with the characteristics shown along with examples in Table 2.2. Given the diversity of its applications, it appears that the concept of the serious game can apply to a vast field of applications, and it is not limited to training, although it seems particularly beneficial for educational purposes. With particular modifications of the salient characteristic features of serious gaming (i.e. teaching and entertainment objects), the method can be applied in almost any context (e.g. for all learners, from preschool age to adult learning) to improve knowledge and enable the acquisition of skills (Mouaheb et al., 2012). Therefore, the

functions of serious gaming should be amenable to the improvement of citizen participation and employee training in the e-Government concept.

Table 2.2: Serious games characteristics

Characteristic	*Serious game*
Teaching	Learning process
Entertainment	Game
Technology	Application of video game technologies
Learning objectives	Teach, train, educate, health
Applies to	Education, training, health, military, politics, advertising, business
Age groups	Children, teenagers, adults, and older people

The main features and differences between games for entertainment and serious games are shown in Table 2.3. It can be seen that the various implicit objectives of serious games that distinguish them from games designed primarily for entertainment include gaining knowledge and experience, improving skills and physical improvement. Furthermore, the educational benefits of using serious games are now undeniable, due to their widespread adoption and application, with demonstrable success, as teaching tools.

Table 2.3: Differences between entertainments and serious games

	Entertainment Games	*Serious Games*
Rule/ Gameplay	Yes	Yes
Interaction	Yes	Yes
Challenge	Yes	Yes / No
Explicit Objective Entertainment	Yes	Yes / No
Implicit Objective	No	Yes

Any cerebral or corporal contest with an objective or goal, controlled with a set of rules or certain framework determining how a user can and cannot act within a scenario/world, can be considered as a game. As shown in Figure 2.4, games can be specified via a number of functions such as rule, challenge, interaction and objectives. However, the design of a serious game

involves different processes, technologies and specialists as well as objectives. One of the main functions of serious games is content, which can be considered as important information or messages delivered to players, designed by specialists according to the targets of the game (Gatzidis et al., 2009). These targets are generally related to education, training and informing in an incisive and effective method. Additionally, practice, testing, simulation and treatment can be objectives of serious games (Bellotti et al., 2010).

Another important point that needs to be made clear is the relation between games at one end and simulations, virtual worlds and role-playing at the other. Many researchers have engaged in long and careful consideration of this, emerging with differing views. Generally, a simulation is understood as something that models or represents something else (Narayanasamy et al., 2006), thus the simulation can be utilised in place of the real system.

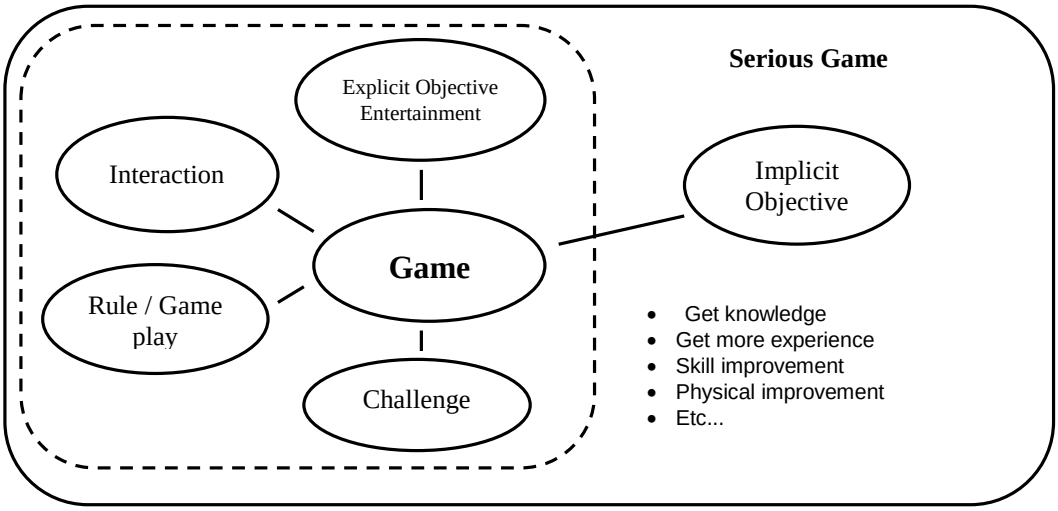

Figure 2.4: The differences between games and serious games

Sauvé et al. (2007) described simulation as models with features of validity, accuracy, and fidelity. Klabbers (2009) similarly agrees that games are less strict than simulations, since the latter are closed models whereas the former

can be partially or fully open ones that can emulate more flexible rules. According to Knight et al. (2010) and Sánchez and Olivares (2011), serious games are video games that offer opportunities to be employed via reacting in scenarios that inform and influence to promote well-being and experiences to express meaning. Similarly, serious games are defined as experiential environments with less or no entertainment features for experience at one side, through to a continuum from games for purpose at the other side (Guillén-Nieto and Aleson-Carbonell, 2012). In conclusion, games and simulations are different in their fundamental characteristics (Sauvé et al., 2007). A brief description of position of serious games in relation to games and simulations is shown in Figure 2.5.

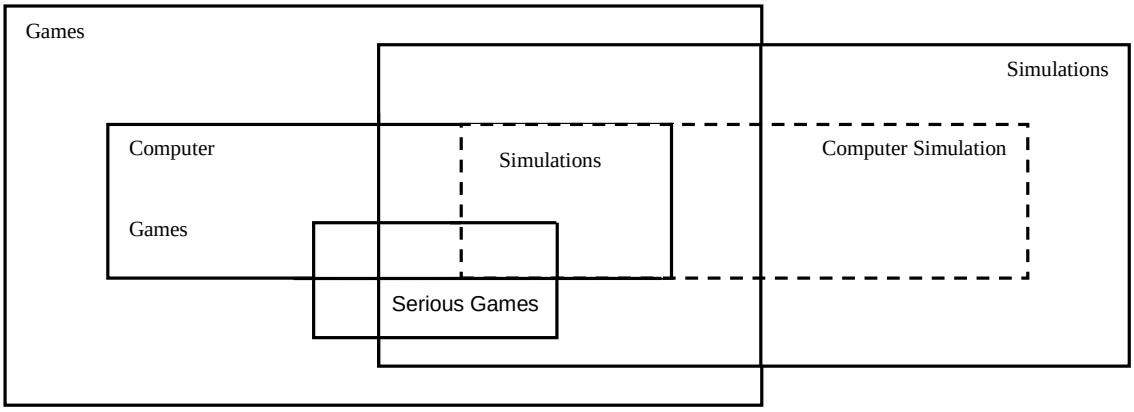

Figure 2.5: Position of serious games in relation to games and simulation

2.11 The Use of Serious Games

In recent years, serious game technology has been used for different purposes, such as education, healthcare, training, commercial and military operations (Poplin, 2012). Although the value of using serious games in education is undeniable and the possible benefits of using video games as ideal learning tools are widely accepted, there is still uncertainty about which

game features support learning efficiency, the process by which games engage learners, and the levels of learning outcomes that could be achieved through game play; ultimately it is expected that different features will be more beneficial for different kinds of learners, as with all educational techniques.

2.11.1 Learning and Expanding Knowledge

Sánchez and Olivares (2011) found that mobile serious games (MSG) have a positive good impact on learning activities, particularly problem-solving development and collaboration skills, perceptions of science improvement, and increased motivation for learning in the early stages of students' education. Moreover, serious games have been developed to cover diagnostic and therapeutic applications, and the health industry and health information systems both are witnessing growing attention to and usage of serious games. According to Guillén-Nieto and Aleson-Carbonell (2012), utilising serious games in the medical industry and health information systems is providing more effective user knowledge, experience and health outcomes. In addition, serious games based on First Aid Education for healthy lifestyle for patients, such as children with constipation, was demonstrably effective (Connolly et al., 2012). The content of serious games is designed by specialists to fulfil the game purpose, and it has been considered that one of its key functions is to deliver important information or messages to players (Gatzidis et al., 2009).

2.11.2 Public Training

The training of soft skills in technical settings has become more and more important for an effective communicative exchange between citizens in any

community. Serious game training based technology has provided a method that enables its users to train soft skills in a virtual environment under safe conditions (Haferkamp et al., 2011; Smith et al., 2015). Research from various disciplines (e.g. psychology and computer science) has recently suggested that serious games are effective media for teaching educational content (Knight et al., 2010; Mouaheb et al., 2012). According to Kirriemuir and McFarlane (2004), serious games maintain high user motivation of users on the one hand and support the opportunity of 'learning through doing' on the other. This combination of entertainment and simulation offers a fruitful framework for education and training purposes. The serious game has been used in different types of training, such as group decision-making processes, emergency management and military operations (Knight et al., 2010). Moreover, virtual environments have used serious games in disaster communication training and risk management.

2.11.3 Citizen Participation

Public participation strategies aim to attract citizens to discuss current issues related to their environment, and online applications can be used to improve the process of public participation in general. An integration of serious game technologies with public participatory tools represents one of the latest innovations in this area. Many researchers discussed ways of integrating new applications into participatory processes and considered which new functionalities and technical characteristics could offer the most benefit to users. M-government was one of the latest techniques to distribute the system widely in order to enlarge the number of users, but it does not seem to empower citizens' intention (Van Belle and Cupido, 2013). As stated

previously, citizen participation is one of the main factors that lead to the success of any e-Government project (Cegarra-Navarro et al., 2014). In addition, most unsuccessful e-Government applications in developing countries failed due to lack of public participation (Mkude and Wimmer, 2013). The question therefore arises of how the significant barriers to public participation in e-Government can be overcome in order to attract citizens to participate.

Pereira et al. (2012) proposed that four learning categories can be support by serious games: personal skills, interpersonal skills, applied ethics and social awareness. Two main reasons increase the accessibility of the use of serious games in various industries: providing a strong proof-of-concept and an endorsement of learning efficiency; and providing a reachable, low-cost tool for learning (Trybus, 2010).

To conclude, with the growing attention and use of the gaming industry for non-entertainment purposes, serious games and game-based learning technologies have brought undeniable benefits to all fields in which they have been deployed, such as education, training, health, military and risk and safety management. Serious games have been defined as functional video games designed to promote understanding of concepts (education), improve user skills (training), conform to the environment (treatment of phobias), or deliver a message (e.g. promotion, advertising, ideological messages), also known as political games (Ahmed et al., 2014). Therefore, it is clearly necessary to understand how the use of serious games affects, benefits and improves the quality of e-Services.

After this brief review of all e-Government, e-Services acceptance models, and serious games, the following section presents a review of the country for this research, Libya.

2.12 E-Government in Libya

2.12.1 Background of Libya

Libya is an Arabic republic located in central North Africa, along the southern Mediterranean shore. It is the fourth largest country by area in Africa, and seventeenth in the world, occupying an area of almost 1.8 million km^2, with a population of 6.5 million. The three major cities of Libya are Tripoli, Benghazi, and Sabah. The capital of Libya is Tripoli, which is home to approximately 20% of Libya's population. Libya has the fifth highest GDP per capita in Africa, based on its large oil and gas reserves (World Bank, 2016).

While this study does not purport to examine governance in Libya *per se*, it is necessary to understand the salient features of the legacy system in the country. From 1969 to 2011 Libya was governed by socialist doctrines characterised by a high level of state ownership, micromanagement, centralisation and a lack of transparency. The state continues to play a major role in all economic activity in the country. It is likely to do so for the foreseeable future due to the poor development of civil society institutions and a stand-alone private sector (Forti et al., 2014). Therefore, it is essential during this transitional period (toward a standard neoliberal economy) that the role of government is rethought in the adoption of e-Government services if Libya is to survive and flourish in the globalised economy. On the functional

level, it is important that e-Government in Libya harnesses modern technology to improve the quality and quantity of services rendered to citizens.

The transformation from traditional to e-Government services is complex, touching the political, cultural, organisational, and technical aspects of everything that the government and other public service providers do. In dealing with this challenge, governments need to integrate work systems, processes, development, and welfare into a very strong performance management system that employees can use effectively.

2.12.2 Education Sector in Libya

The Libyan population is young (with 50% of Libyans being younger than 25) and urbanised (86% of the population live in the main cities). Additionally, Libya has one of the highest literacy rates in Africa. Libyan public education is free and compulsory for all citizens aged 6 to 15. In addition, the demographics of the population show that there is a large percentage fall in younger age groups; for example, around 30% of the population are studying in educational institutions (Table 2.4).

Table 2.4: Educational statistics for Libya 2015

Type	Figure	Source
Literacy rate	99% (15-24) & 90% (overall)	www.databank.worldbank.org
No. Of schools (public, private)	3269	Ministry of Education www.higheredu.gov.ly
No. Of primary & secondary level students	1,312,537	Ministry of Education www.higheredu.gov.ly
No. Of universities (public) No. Of universities (private) No. Of higher institution (public, private)	12 5 96	Ministry of Higher Education highereducation.gov.ly
No. Of tertiary level students	538,000	Ministry of Higher Education highereducation.gov.ly

2.12.3 Telecommunication Sectors and Internet Users

Figure 2.6 shows three different dimensions of the telecommunication sectors in Libya between 2006 and 2015. The percentage of mobile cellular subscriptions was the highest throughout the period, rising from 69% in 2006 to just over 160% in 2015, after peaking at 180% in 2010. Internet users grew steadily from 4.3% to 37.4% by the end of the period. There was a slight increase in fixed broadband Internet subscribers from 0.8% in 2008 to just under 2%. To sum up, Libya had 2.4 million Internet users as of November 30th, 2015, representing 37.4% of the population, and the same percentage of Facebook users on November 15th, 2015 (Internet World Stats Report, 2015) although mobile cellular subscriptions were still the most popular in 2015.

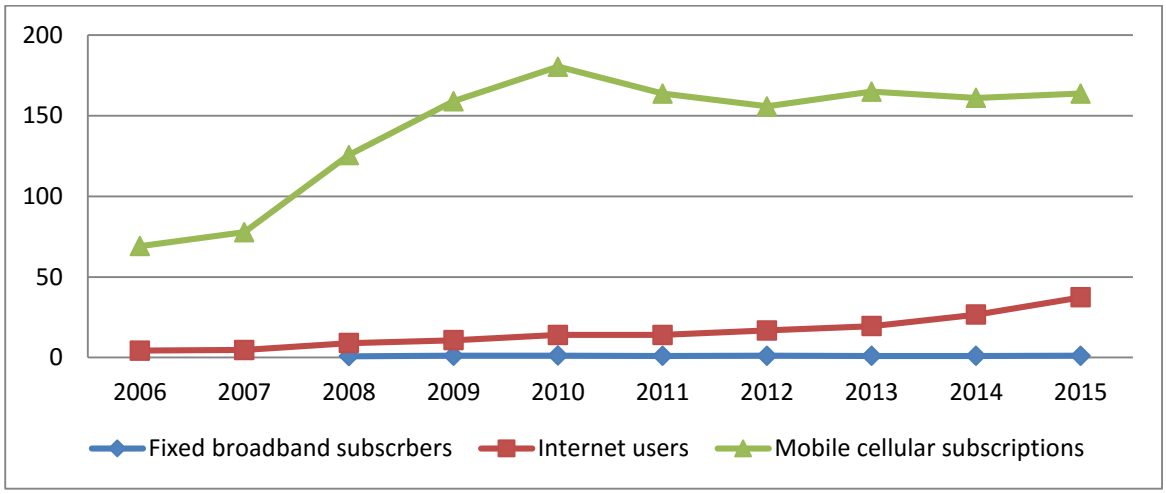

Figure 2.6: Telecommunication sectors in Libya between 2006 and 2015

(World Data Bank, 2016 & Internet World Stats Report, 2015)

2.12.4 E-Government in Libya

According to the National Audit Office's (NAO, 2002) report, web e-Government is mainly seen as progress with five basic stages of development, indicating the online presence and evolution of government.

These stages start from a basic site stage that gives electronic versions of the government's major print documents for public consumption. Stage two is the e-Publishing stage where citizens or businesses can download forms to fill in and post back. The interactive stage is the third stage that allows citizens to have basic interaction with the government agencies. There are also hosting search engines on the sites for easy navigation. Stage four is the transactional stage where direct interaction is applied, such as making secure payments. Finally, the transformation stage is achieved when the public sector websites facilitate one-stop shop initiatives as an integrated platform for government services and organisation totally transparent to citizens and businesses.

According to research as a part of this PhD programme, Ahmed et al. (2013) revealed that 70% of Libyan national ministries are online, with full provision of information about services, but limited interactions are possible with the government except via emails. Thus, Libya is generally situated between stages I and II of the e-Government stage model, although it reached stage III in some cases (Figure 2.7). However, 30% of national ministries have not yet achieved the initial stage I. To conclude, the government of Libya still has a lot to do to be able to conduct online government transactions.

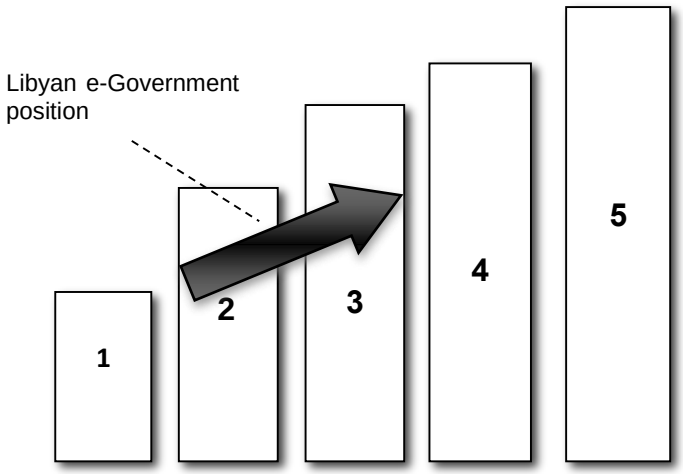

Figure 2.7: Stages of Libyan e-Government (based on NAO stages model)

Source: NAO (2002)

2.12.5 Online Appearance of Government Agencies

A summary of an online survey conducted on March 10th, 2016 by some government ministries in Libya relating to their presence on the internet based on stages of e-Government projects report on the government as it is shown in Table 2.5.

Table 2.5: An online survey of some Libyan Government ministries

(Conducted on March 10, 2016, based on NAO stages model)

Informational level (stage I)	*Communication level (stages II and III)*	Transactional level (stages IV and V)	Stage	URL
Prime Ministry/official website				
Yes	No	No	I	http://www.pm.gov.ly/
NID and its relevant projects				
Yes	**Yes**	**Yes**	**IV**	**http://www.nid.gov.ly/**
Ministry of Justice				
Yes	Yes	No	II	http://www.aladel.gov.ly/
Ministry of Communications and Information Technology				
Yes	Yes	No	III	http://www.cim.gov.ly/
Ministry of Labour and Retraining				
Yes	Yes	No	III	http://www.labour.gov.ly/
Ministry of Interior				
No	No	No	II	http://moi.gov.ly/
Ministry of Economy				
Yes	Yes	No	II	http://www.ect.gov.ly/
Ministry of Education				
Yes	Yes	No	III	http://www.edu.gov.ly/
Ministry of Foreign Affairs				
Yes	Yes	No	III	http://www.foreign.gov.ly/
Ministry of Defence				
Yes	Yes	No	II	http://www.defense.gov.ly/
Ministry of Planning				
Yes	Yes	No	II	http://www.planning.gov.ly
Ministry of Social Affairs				
Yes	Yes	No	III	http://www.sa.gov.ly/
Ministry of Finance				
Yes	No	No	I	http://www.mof.gov.ly/
Ministry of Agriculture				
Yes	Yes	No	III	http://www.agriculture.gov.ly/
Ministry of Industry				
Yes	Yes	No	II	http://industry.gov.ly
Ministry of Scientific Research and Higher Education				
Yes	Yes	No	II	http://highereducation.gov.ly/
Ministry of Housing				
Yes	No	No	II	http://www.mhu.gov.ly/
Ministry of Transportation				
Yes	Yes	No	III	http://www.mot.gov.ly/

The National Identification Number (NID) and its relevant projects are the most developed e-Government services in Libya, reaching the transactional level. Libyan passport renewal is one of its relevant projects, and producing a new electronic passport for all citizens is one of the government main targets. To conclude, the government of Libya must continue to develop its e-

Government facilities in all respects in order to enable citizens to conduct online government transactions.

2.12.6 Challenges and Opportunities

2.12.6.1 Technical

A lack of awareness of new technologies is often one of the main challenges facing the implementation of e-Government services. The Libyan government launched its official website in June 2005, initially targeting a few key services such as providing information about legislation, laws and Prime Minister Activities. Furthermore, the Libyan government has still not yet formulated e-Government services and e-Business laws, such as laws for incorporating digital signatures. Additional important challenges that face Libya in implementing e-Government include the lower level of computer ownership and internet access due to the low speed of connection, and real and perceived security threats (Yang and Rho, 2007). For successful e-Government, service continuity is important for both availability and delivery of services, and also to build trust and confidence amongst citizens. Some weaknesses were identified for IT projects, such as software development and change controls, security programme management, access controls, operating systems controls, and service quality.

In the Libyan context, cloud computing offers the best solution concerning secure and continuous availability of e-Government services. According to Wyld (2010), cloud computing incorporates major tenets such as instant availability of services, massive scalability and pay per use model. In addition,

cloud is built with Service Oriented Architecture principles, and therefore is highly flexible and modular, and can integrate with other systems.

2.12.6.2 Infrastructural

There are telecommunication infrastructure and access challenges, such as resistance to the usage of the internet due to the limited bandwidth and the high cost of using new technologies. In comparison to other countries, access costs are high in Libya, which generally has a negative effect on the efficient usability of the network within Libya. Additionally, there are further challenges in the limited availability of landlines in Libya. Currently, there are ten landlines to every 100 people in Libya; this chronic shortage of lines is a massive barrier to internet use compared to international norms.

The full benefits of e-Government services can only be obtained when the majority of the people get access to the internet and electronic service channels and fully engage with the system. Whilst the primary delivery method for e-Government services is the internet, governments have been researching, designing and implementing a number of other e-Channels, including mobile phones (m-Government). For instance, in Libya the literature indicates that around 37% of the population (i.e. slightly more than a third) regularly goes online, as shown in Figure 2.6, whereas mobile phone penetration is saturated, with 150% of Libyans (i.e. 1.5 per person) having mobile cellular subscriptions. This solution could be applied due to the current capability of providing services until the government is able to overcome the potential challenges and barriers to introduce full e-Channels and technology infrastructures with respect to e-Government services (Ahmed et al., 2013).

2.12.6.3 Cultural

There is no universal model to implement e-Government and it is necessary for the Libyan government to take into account the cultural, political and demographic dimensions in order to narrow the gap between the theoretical design and practical reality of the system (Elsheikh et al., 2008). Heeks (2003) agreed that such theory-practice gaps are the underlying cause of the failure of e-Government projects in developing countries. Due to its dependence on international experts to build e-Government initiatives, Libya has little authentic consideration of or input from the specific national context in terms of cultural and social issues. This is in addition to the latent lack of citizen awareness, trust and participation, which the Libyan government must consider and address for successful implementation of e-Government.

2.12.6.4 Social

Social issues include a lack of computer literacy amongst citizens and indeed government employees. Some efforts have been made in the public sector to strengthen capacity and knowledge regarding ICT (Elsheikh et al., 2008), but resistance to change on the part of government employees is still a challenge to the development of e-Government. Better governmental focus on capability building through general courses and training would build confidence and increase the understanding of the possible opportunities ICTs offer as a tool for changing and improving the way that the government operates. Additionally, Libya presents a special case, as a vast country with a small and young population; furthermore, around 30% of the population are studying in educational institutions. Accordingly, there is an opportunity to inform and

train a significant part of the population about e-Government services by providing ICT courses at educational institutions (Ahmed et al., 2013).

2.13 Why Libya?

Libya is an African developing country that is confronting genuine challenges in adopting e-Government. It has established an e-Government project, although it still in the early stage of development. Libyan e-Government aims to provide e-Services to citizens, businesses and other stakeholders all around the country with a specific end goal to mitigate the weight of centralised organisations.

The Libyan Ministry of Communications and Informatics (MCI) was mandated to develop a strategy for e-Government project to modernise Libyan government services. This initiative put ICT at the forefront of government operations to enhance the services provided to all citizens, residents and businesses, wherever they are and at all times (MCI, 2014).

An extra substantial effort is required for this project to become a reality with the right efficiency measures in place to avoid any possibility of failure. The government is seeking better service delivery to the public to gain speed and ease of access to services by creating new operational processes and developing current services. In addition, it purports to provide equal opportunities for all citizens and residents to access services with increased responsibility, transparency, performance and availability of general information, while reducing corruption and wasteful government expenditure (MCI, 2014).

In the context of developed countries in North America and Europe, much research on e-Government has been conducted that has improved the functional capabilities of available models presented in 2.2.2. However Libya has fundamentally different e-Government users' experience, knowledge and familiarity with e-Services. Additionally, Libyan e-Government results thus far have not been seriously researched. Thus, it is crucial and worth investigating factors that influence citizens' use of e-Government in the country to help the government address these factors and empower citizens to participate in the e-Government system. The importance of this research is to help achieve benefits from using serious games as a tool to improve e-Government users' intention of engagement.

2.13.1 The Libya e-Government Philosophy and Objectives

The main responsibility assigned to the Libyan e-Government project (hereinafter 'eLibya') is to enable the implementation (i.e. successful foundation) of e-Government, reducing the centralisation of e-Government implementation as much as possible while ensuring necessary coordination between the governmental agencies involved. Figure 2.8, taken from the eLibya Program (2014), depicts the four domains that the program's mission addresses (MCI, 2014). The following are the main principles of the strategy adopted in Libyan e-Government project:

- Governance
  - Oversight, funding, and legislation
  - Smart e-Government investment and private sectors development
- Technology
  - Shared common infrastructure
  - Shared common application

- Citizen centric services
  - E-Services
  - Next generation government
- Capacity
  - Capacity building

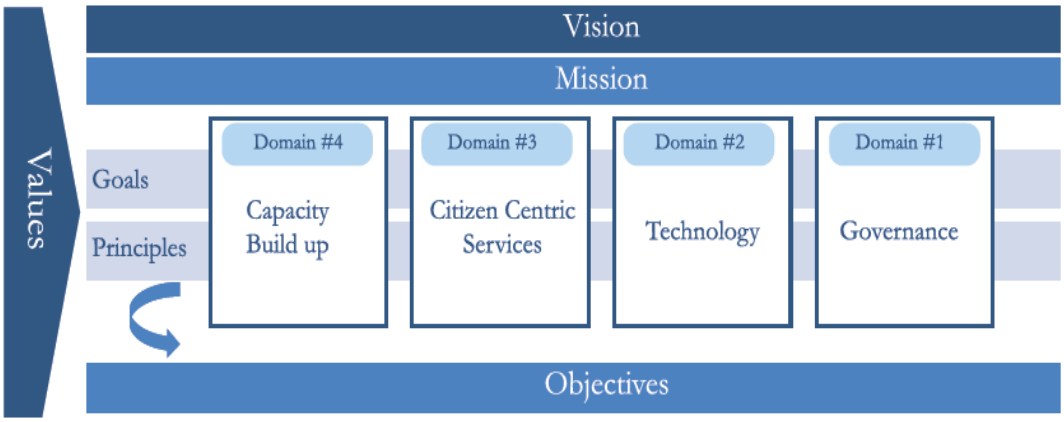

Figure 2.8: The Libyan e-Government Strategy Development Phases

Source: General Authority of Communication and Informatics (MCI, 2014)

2.13.2 Barriers to e-Government in Libya

Online services require extensive technical knowledge for developing and operating successful e-Government. Important knowledge issues arise because the technological and management understanding required to successfully deploy these complex technologies goes far beyond the simple awareness of a need for innovation. E-Government services are typically constrained by a combination of political, legal, public policy, organisational, technological, and human capital issues.

Conditions are very different among developing countries and each country has its own set of cultural, social, political, economic, and technological factors that influence whether e-Government implementation would be successful or not, as well as citizens will actually go online to use the

services. These intrinsic problems are compounded by developing country related issues in contexts such as Libya. Preliminary investigation of the e-Government infrastructure indicated that one of the most important factors is user acceptance (i.e. User Trust and Confidence). However, Libyan citizens are still not participating adequately for the project to be successfully implemented.

2.14 Summary

Research on e-Government and successful adoption has been reviewed in this chapter, as well as some other important and relevant concepts, such as technology acceptance and user satisfaction. Moreover, this chapter reviewed the use of serious games in different field and its advantages, finishing with a review of e-Government in Libyan context as developing country.

The theories and models pertinent to successful e-Government adoption have been considered and the potential factors that contribute to success identified. The investigation of the studies for understanding e-Government success from a citizen participation perspective reveals that there is no framework that considers all the important factors conducive to e-Government users' acceptance and engagement in developing countries. The literature clearly demonstrates the absence of inclusion of important factors of IU and testing and validating them in a single framework from the individual perspective. Also, no study has been conducted to explore the use of serious games as a tool to improve citizens' intention in an e-Government context, to assist developing nations in achieving effective e-Government and reducing the risk of failure.

3 Research Methodology

3.1 Introduction

This chapter introduces the research approach, methodology and design used in this study, identifying the research paradigm adopted, justifying the methodology and explaining the research design used. Since this study comprises multiple stages, this chapter starts by describing the development of the research model used in the study. It presents justifications for the chosen research paradigm, followed by a discussion of the theoretical perspectives of the methodology in the field. Next, the research design that provides an explanation of the research process and methods of data collection and analysis applied in this research is presented, including a discussion of the development of the framework and validation process section, as well as the e-Reservation game development and post-test evaluation.

3.2 Research Developing Model

This research was guided by using Crotty's (1998) framework of developing a research study, shown in Figure 3.1. The framework proposes four main elements for developing a research model: paradigm, theoretical lens, methodology and method of data collection. The research paradigm focuses and explains the researcher's point of view in the perspectives of epistemology and ontology. The second level is the theoretical lens that determines the philosophical perspective of the research scope. The third level of methodological approach describes the nature of the general approach of the study (i.e. qualitative, quantitative or mixed). The last level of

data collection method indicates the data collection methods used in the research.

Figure 3.1: Levels for developing a research study

Adapted from Crotty (1998)

3.3 Research Paradigm

A paradigm has been defined as the systems of beliefs and practices that influence how researchers select both types of research questions and methods used to study them (Morgan, 2007). The research questions, design and data collection are affected and reflected by research paradigm.

In behavioural and social science, there has been a debate between two major paradigms, post-positivism and constructivism (Onwuegbuzie and Leech, 2005). Clark and Creswell (2011) summarised these differences as presented in Table 3.1.

Table 3.1: Differences between post-positivism and constructivism

(Clark and Creswell 2011)

Paradigm elements	*Post-positivism*	*Constructivism*
Ontology	Singular reality (e.g. researchers reject or fail to reject hypotheses)	Multiple realities (e.g. researchers provide quotes to illustrate different perspectives)
Epistemology	Distance and impartiality (e.g. researchers objectively collect data on instruments)	Closeness (e.g. researchers visit participants at their sites to collect data)
Axiology	Unbiased (e.g. researchers use checks to eliminate bias)	Biased (e.g. researchers actively talk about their biases and interpretations)
Methodology	Deductive (e.g. researchers test an *a priori* theory)	Inductive (e.g. researchers start with participants' views and build 'up' to patterns, theories, and generalisations)
Rhetoric	Formal style (e.g. researchers use agreed-on definitions of variables)	Informal style (e.g. researchers write in a literary, informal style)

The research objectives and context determine the suitable research paradigm for this study. This research is aiming to investigate the behaviour of individuals; this is a very subjective issue as individuals have their own experiences and perspectives. Moreover, the research conceptualises the issue of e-Government more comprehensively, since people's participation is an undeniable problem in developing nations, such as Libya (Ahmed, 2014). Consequently, it is very challenging to conduct research to understand the behaviour of individuals while at the same time attempting to generalise the findings. A researcher needs to explore and capture this complex phenomenon carefully and provide meaningful explanations.

This research applied a post-positivism paradigm based on the above reasons, whereby researchers are independent of the object of research (Krauss, 2005). In addition, positivism is linked to experimental science, and its scientific knowledge is accurate and certain (Crotty, 1998).

Positivism is most closely associated with quantitative methodologies, whereby a priori hypotheses are generally tested by experimentation yielding

numerical data, however in this study qualitative data was also collected and analysed to investigate and enhance understanding of the research problem. When both quantitative and qualitative methods are used in a single study for data collection, it is known as a mixed method approach (Arora and Stoner, 2009).

3.4 Research Methodology

In addition to its closer association with the post-positivism paradigm, quantitative research methodology is the most commonly used in the field of information systems (Mingers, 2001; Wu, 2012). Chen and Hirschheim (2004) investigated a large sample of published information systems studies and found that 81% used quantitative methodologies. However, this research adopts the mixed research methodology, which has been identified as the third methodology approach or the third community of research (Teddlie and Tashakkori, 2009). The use of mixed methods is apt when scholars wish to achieve the benefits of both qualitative and quantitative methods in fulfilment of their research objectives, minimising individual weaknesses of each approach and providing stronger and more comprehensive results (Hohenthal, 2006). Mixed research is still considered as a new methodology and it is underutilised in the field of information systems, but it is expected to deliver more comprehensible results to the field of IT and computer science CS for non-technical purposes than those delivered by other research methodologies. For instance, (Hazzan et al., 2006) argue that qualitative approach may enable researchers to expand and deepen CS research findings. Moreover, quantitative research approach has been widely applied to CS research (Amaral et al., 2011).

The decision to choose mixed methodology as the most appropriate design for this research was based on the research questions and objectives. Since this study explores the difficulties of the successful implementation of e-Government in developing countries, Libya, the qualitative methodology was applied first to investigate the state of Libyan e-Government project and barriers facing its implementation through the use semi-structured interviews. That part of field study was important to explore and refine the main research problem. Moreover, this research exploring a new framework to increase citizen' participation with e-government in its real context. There is an urgent need for more research attempts, especially in the context of this research to determine to what extent the use of serious games can be effective in developing citizens' adoption of e-Government, which allows generalising the results and therefore used in the same context or in other contexts with similar circumstances. For that quantitative method is used as one of the advantage of quantitative research method is contribute to greater confidence in the generalisability of results.

Therefore, this research basically employed three basic steps of data collection: field study, national survey, and post-test questionnaire. Details of each step are explained in the following sections.

Based on the previous discussion of the methods and research objective, this research used the design of exploratory sequential with the quantitative method as the major approach. The design, shown in Figure 3.2, is according to Clark and Creswell (2011) the most reliable to explore a phenomenon in depth.

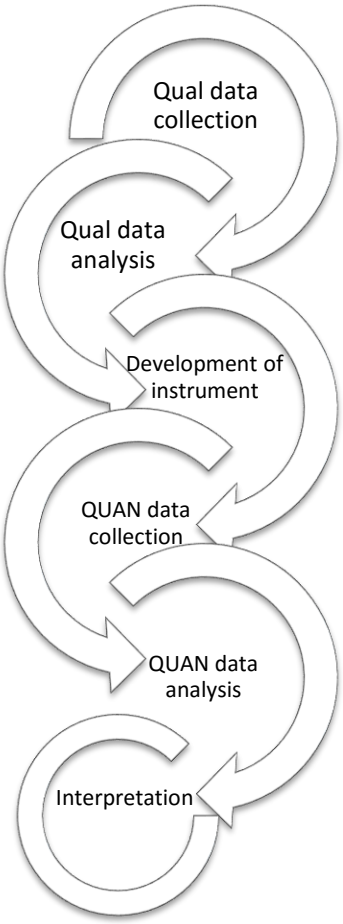

Figure 3.2: Diagram of exploratory design

Adapted from Clark and Creswell (2011)

3.5 Research Methods and Design

Due to the lack of information concerning the country's e-Government strategy and its particular implementation and adoption, Libya was chosen as a developing country for this research.

The research was conducted in three sequential stages, as shown in Table 3.2. Stage one is the review of the literature and formalising the research problem, including an extensive review of the literature regarding e-Government implementation. It also incorporates conducting a preliminary investigation of Libyan e-Government to serve as a foundation to formalise

the research problem of the context. Stage two is the building and validation of the framework, which involved three phases: reviewing the literature on extant serious games use and design; building a conceptual framework; and the process of validating proposed framework. Finally, stage three is the testing of proposed framework, which was achieved by designing and implementing a serious game prototype then testing and evaluating it. More details regarding data collection methods, sampling, data analysis and piloting studies for each stage are described in next sections.

Table 3.2: Overview of the research methodology

1	*Literature review and formalise research problem*
	Reviewing extant e-Government literature
	Investigating Libyan e-Government status
2	*Framework building and validation*
	Reviewing extant serious games literature
	Building conceptual framework
	Validating proposed framework
3	*Proposed framework testing*
	Designing and implementing serious game prototype
	Testing developed serious game

3.6 Stage One

An extensive literature review identified the issues and factors of e-Government success and failure in developing countries, highlighting potential key variables, and an initial research model was developed. Then, this was explored and enhanced using the qualitative method which aimed to explore and capture reality in detail from human perspectives and experiences (Chan and Ngai, 2007). Figure 3.3 shows the procedure of stage one.

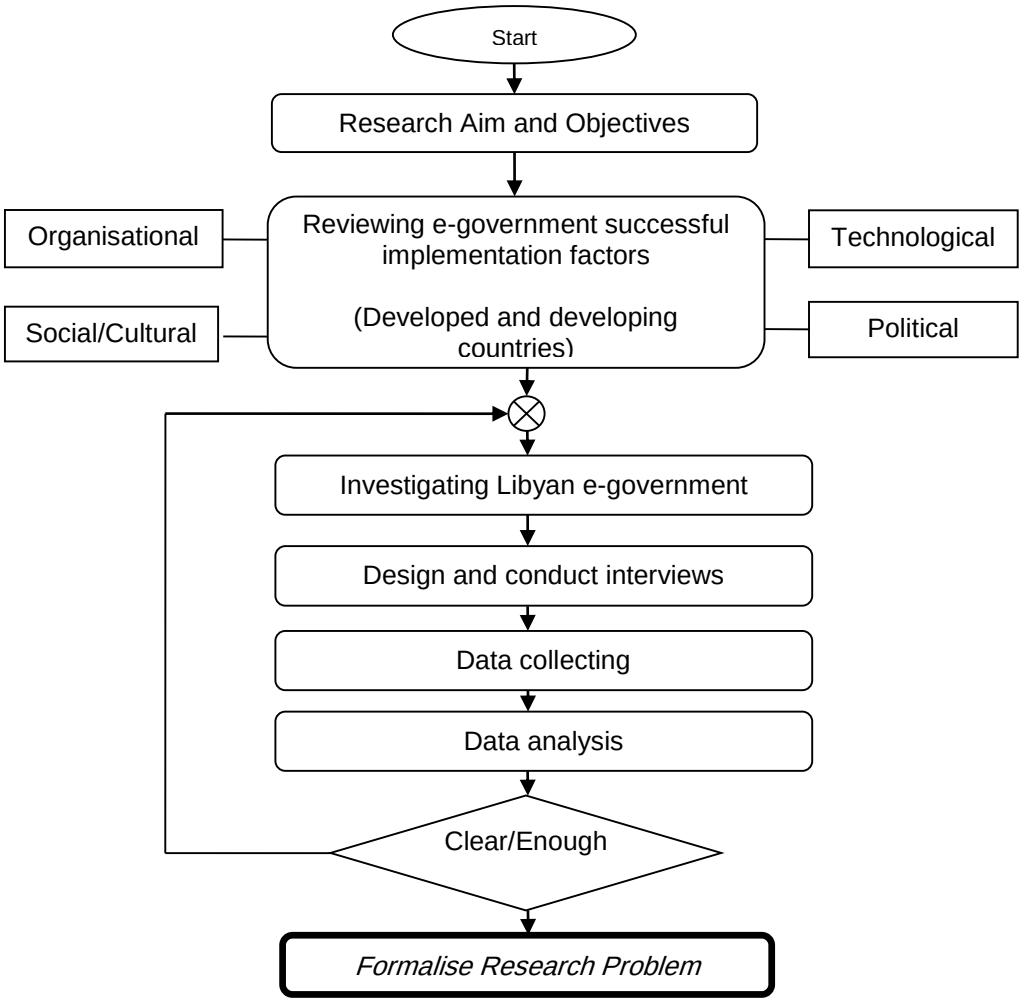

Figure 3.3: Stage one (literature review and formalise research problem)

3.6.1 Sample Selection

The study involved some interviews used to collect the primary data from the interviewees personally. The interview sample was chosen based on participant specialisties. Stakeholders who currently involved in eLibya were targeted and selected (including developers, policy makers and IT managers). One of the main goals of choosing this sample was to know more about the processes of development of e-Government in Libya. As a result, being in touch directly with the officers of the Libyan government provided a clear view of the e-Government in Libya as well as the opportunities and challenges of the Libyan e-Government project from the supplier side. Additionally, research

problems were identified by conducting the interviews with this sample, which enabled me to define several issues been faced by the Libyan e-Government team during the development of the current project. Such issues were not raised in the previous literature reviewed in this research.

3.6.2 Data Collection

Interviews were conducted as an appropriate method to gain contextually based results. Semi-structured interviews with open-ended questions were used, giving the researcher plentiful emergent data from a single source by enabling participants to express their views in their own word, and improving rapport between the researcher and interviewees, conducive to a full and frank disclosure. Although a limited sample size may prevent generalisation the findings, generalisation does not necessarily generate more significance or accurate conceptions, and the in-depth findings emergent from expert interviews are a strong source from which to draw conclusions.

Thus, the nature and scope of interview data would help in the development of measurement instruments, and in identifying factors affected the implementation of successful e-Government services in Libya. The objectives of the interviews were: (1) to explore concepts and procedures that might not be recognised in the existing literature yet; and (2) to evaluate the worthiness of the concepts identified in the literature review. One-to-one, face-to-face semi-structured interviews were conducted with different participants. Interviews were used to collect data from decision maker, government official's managers and e-Government developer regarding e-Government

and public services in Libya. Researcher arranged visits to participants' offices in Tripoli.

3.6.3 Data Analysis

After being transcribed and translated into English by the researcher, a part of the translated data was verified by per-researcher to ensure the validity of the translation. The interview data was managed using thematic analysis. According to Braun and Clarke (2006), thematic analysis is a valuable and flexible method for qualitative research. During data analysis, the main procedures followed started with achieving familiarity with the data, by repeatedly reading, then transcribing and translating the raw data aspects. This enabled the manual grouping of certain data under initial codes for more understanding of the emergent phenomena, followed by collection and reviewing the themes and sub-themes to produce a satisfactory thematic map prior to writing a thematic analysis report.

3.6.4 Pilot Study

For the semi-structured interviews pilot study, semi-structured interviews were conducted with two Libyan researchers (PhD students at the School of Computer Science at the University of Birmingham). The reason for involving researchers was to get comments and suggestions in terms of research perspective. The potential respondents were obtained from the pilot interviews, then from the potential respondents, the researcher expected a valuable response in terms of the applicability and comprehensibility of the terms used. They were asked for their review and suggestions. This procedure was conducted continuously until agreement was reached on the

nature and wording of questions. Data analysis in the pilot study was done using thematic analysis, which was preparatory for the main interviews. Based on the feedback from the respondents, there was no modification needed to the interview questions.

3.7 Stage Two

This stage is for framework building and validation. A survey questionnaire was distributed across different Libyan population in three Libyan universities: Tripoli, Benghazi and Sabha. It was distributed in these three main cities to validate the proposed framework and anticipate future potential barriers of implementing e-Government. As the researcher refined and proposed the model and developed a comprehensive research framework, hypotheses were proposed to justify the relationships among constructs. A questionnaire was designed taking into consideration the Items for each construct were identified. The process of stage two is shown in Figure 3.4.

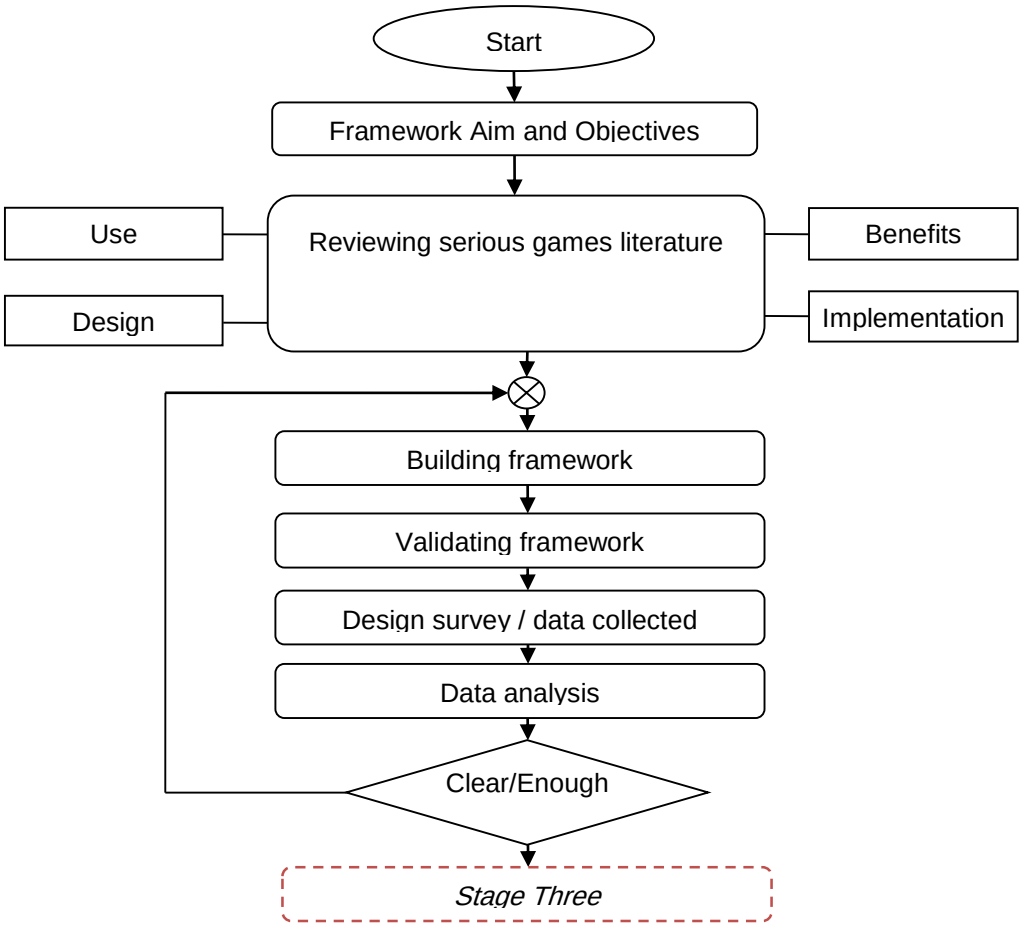

Figure 3.4: Stage two (framework building and validation)

3.7.1 Sample Selection

For the survey, the samples are Libyan citizens who may or may not have experience in using e-Government systems. However, it was necessary for all of them to know the meaning and nature of e-Government. As suggested by many scholars, samples should be representative and appropriate (Cavana, Sekaran and Delahaye, 2001). For this reason, higher education institutions were selected to conduct the survey, as the respondents are highly likely to be familiar with the meaning and nature of e-Government due to their increased exposure to e-Learning concepts and ICT generally. Using

sufficient samples leads to more convenient results which high likely to be valid.

3.7.2 Data Collection

The survey questionnaire was distributed at three Libyan universities: Tripoli University, Benghazi University and Sabha University, after informing the universities and have their permission. Time was selected where community events were taking place, after arranging with the event organizers copies were given to random respondents. Educational institutions were chosen to conduct this survey for several reasons, such as getting the most reliable answers, and reaching respondents from different age groups, education levels and income levels. As a result, 150 copies of questionnaires were distributed, of which 117 were retrieved. Finally, 106 responses were used in this research.

3.7.3 Data Analysis

The unit of analysis is individual. The analysis of the quantitative data is divided into three parts. First, the analysis of the demographic information was conducted to control research bias towards a particular region. Second, statistical tests for differences in contacting government agencies or service providers among respondents was conducted, as well as the interest of electronic games across the three cities. Third, the research hypothesis was tested by conducting multiple regression analysis. All these analyses were conducted using SPSS (Statistical Package for the Social Sciences) version 20, which offers an effective data management and a range of methods, graphs, and charts. The reliability of each construct was measured by

Cronbach's alpha to ensure they were all greater than the recommended value of 0.70 (Hair et al., 2010). In addition, confirmatory factor analysis (CFA) was conducted to examine how well-measured variables represent a small number of constructs (Hair et al., 2010). Confirmatory factor analysis (CFA) is a statistical technique used to verify the factor structure of a measurement instrument (Suhr and Shay, 2009).

3.7.4 Pilot Study

For the questionnaire pilot study, questionnaires were distributed in English for pre-testing to 17 respondents of different ages and educational levels (Libyan undergraduate, master's and research students in the UK). The reason for involving different age groups was to match expected age groups in Libyan education institutions, where the main survey is taking place. The potential respondents were obtained from the pilot survey, then from the potential respondents. The researcher expected a valuable response in terms of the applicability and understandability of the terms used. Data analysis in the pilot study was done using SPSS analysis, which enabled evaluation and checking coding for the main survey. Based on the answers from the respondents, the main survey was modified to the last version needed.

3.8 Stage Three

This stage is the development of a serious game artefact. E-Reservation serious game was developed based on a framework that applies the benefits of using serious games as a tool to improve citizens' intention of using e-Government. Considering the proposed framework objectives, and the e-Government service available for citizens to use in Libya, the researcher set

the criteria for this system used in this study: e-Reservation services for booking a time slot for passport renew/issue systems provided by local governments in Libya. A post-test questionnaire was developed (Appendix D) to discover the participants' satisfaction rated the Perceived Usefulness (UF), Ease of Use (EoU), Internet trust (IT), and Government trust (GT) to express their willingness to use the actual services after trying it in a game. These four variables were included as they are the main variables in the proposed framework. In addition, this stage includes examination of the impact of entertainment feature within the e-Reservation game. The game was modified to be an interactive simulation of the actual e-reservation service with details explanation and guide of each step of the service. Besides, the simulation provides a description of privacy and security protocol behind the service. A quantitative comparative experiment using a control group was conducted in a format of simulation by not including the entertainment elements in e-Reservation serious game. The role of the control group is to use their results to measure the effect of entertainment within the game. Then repeated measure design was applied to execute the experimental control group. It allows the researcher to focus on one variable (Age) among both experiments and control group Misangyi et al.(2006).

The process of stage three is shown in Figure 3.5.

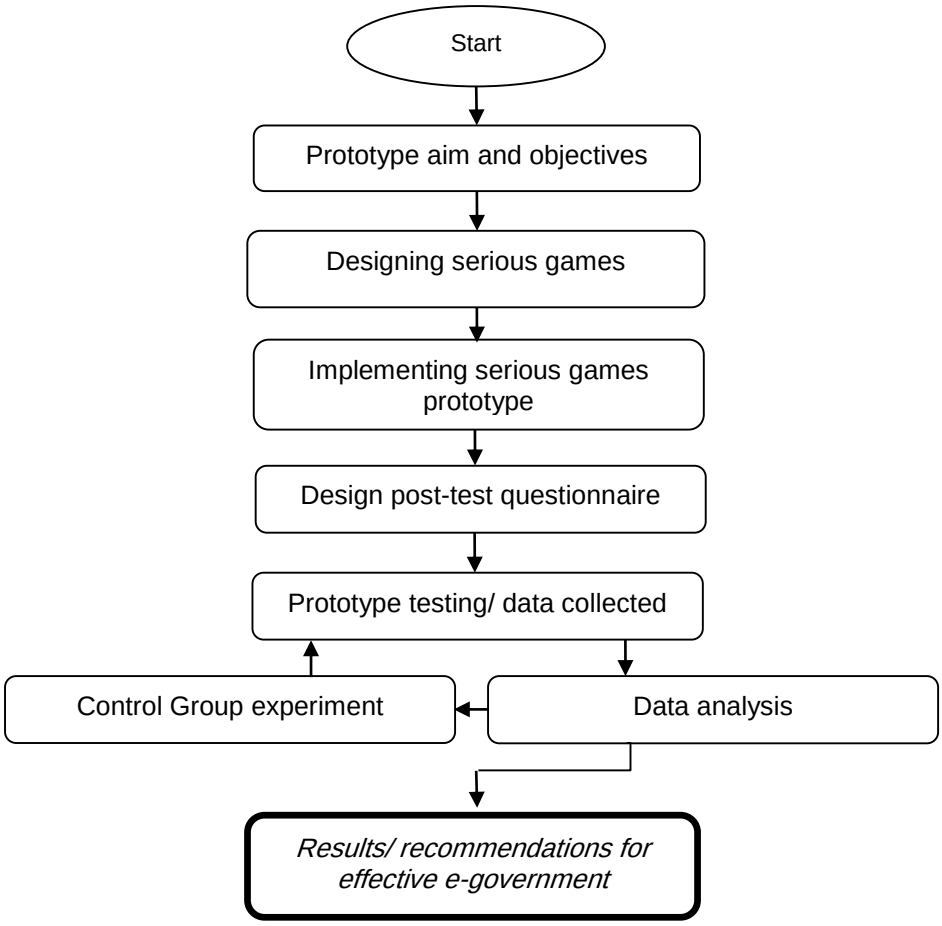

Figure 3.5: Stage three (framework testing)

3.8.1 Sample Selection

For the post-test questionnaire, the unit of analysis is also individual. The samples are the actual e-Service users (Libyan citizens) intending to either renewing or issuing new passport at Passport and Immigration Departments in Libya. Inclusion criteria included that all participants were adult Libyan citizens, the targeted users of the actual e-Reservation service. This also allowed the researcher to gain both pre-test and post-test evaluation, and ensured sufficiently reliable and authentic responses to the questionnaire. For the control group the samples were selected randomly including 19 Libyan

citizens within the UK. The sample was chosen based on their age group 15 – 44.

3.8.2 Data Collection

Adequate samples selection leads to more convenient results that are more likely to be valid. The game was offered for use randomly at a Passport and Immigration Department centre in the city of Sabha, Libya. The pragmatic reason of safety was the major rationale for conducting the data collection near to the University of Sabha, where a number of staff and students helped in the process. A short post-test questionnaire was given to the participants to answer. The game was tested and data collected on different occasions, with the data collection team working in four-day time slots. As a result, 90 copies of the questionnaires were collected. After undertaking a review to seek out errors in the form of invalid data, including missing values or incomplete responses, 85 responses were finally usable in this research stage.

For experimental control group, the post-test questionnaire was used again with control group participants after excluding the entertainment aspects of the game. The questionnaire was distributed upon the participants to fill it and give back. All questionnaire copies were completely filled and successfully returned.

3.8.3 Data Analysis

In this stage of research, the analysis of the pre-test and post-test data is divided into four parts: the analysis of the demographics; statistical tests for pre-Test data to verify participants' knowledge, experience and confidence in using government e-Reservation service; and statistical tests for post-test to

measure the participants' satisfaction and willingness to use the service as well as recommending the game to others. Lastly, control group comparative analysis using compare means and ANOVA test were conducted to obtain participant satisfactory and willingness to use the actual e-Reservation service. All these analyses were conducted using SPSS.

3.8.4 Pilot Study

For the pilot study, game usage and post-test questionnaire were administered in English for the pilot study to eight respondents, who were Libyan research students in the UK. The potential respondents were obtained from the pilot study, then from the potential respondents the researcher expected valuable responses in terms of the applicability and understanding of the terms used. Data analysis in the pilot study was done using SPSS analysis, which allowed evaluation and checking coding for the main post-test questionnaire. Based on the answers from the respondents, the main questionnaire was modified to the last version needed.

3.9 Ethical Considerations

Researchers should observe certain research ethical principles in any research area to conduct their research professionally. These ethical issues are concerned with acceptance and consent, access to the research site, confidentiality, anonymity and safety.

The researcher took the following basic group of principles into consideration, as suggested by the University of Wolverhampton (*Research Handbook*, 2014). Participants in all stages of this research were clearly informed of the purpose and the significance of the research study to the context. Moreover,

participants were well informed of their right to withdraw from the research at any time. The researcher followed the formal procedures so as to legitimise the data collection process, especially during stage three, wherein consent (Appendix E) and an official letter was obtained giving permission to collect data in the research site when required (Appendix F), as it was required to access Passport and Immigration Departments in Libya. For confidentiality, the researcher guaranteed that the collected data was only going to be used for research purposes. Practically, as the interview data were transcribed for anonymity, participants were assured that their identities would not be disclosed to anyone under any circumstances, and none of their personal information, such as names or locations, was requested. Safety concerning the avoidance of causing physical or emotional harm to participants was naturally observed (Fontana and Frey, 2005).

3.10 Research Bias

All research is prone to some degree of potential bias (Robson, 2002). In this study, good research practices that have been widely used and recommended by reputed scholars in this field (as explained in this chapter) were followed to achieve the objectives of the research, and the researcher maintained a sceptical attitude helping to reduce usual bias.

3.11 Summary

The discussion of research paradigms presented in this chapter included justification for the underlying positivist paradigm used in this research. However, mixed method with the exploratory sequential design was chosen as the platform for conducting this research. The design started with a

qualitative study by conducting a semi-structured interview, followed by developing a conceptual framework, then it was validated and verified by quantitative research by conducting a survey. Finally, a serious game was developed and used to test the proposed framework.

4 Developing the Conceptual Framework

4.1 Introduction

In the literature review chapter, e-Government problems and the attributes and utility of serious games were described. The use of serious games and their advantages must be placed in a framework of structured deployment in order to improve e-Government in developing countries. This chapter discusses the development of such a framework. This chapter starts by discussing the optimum use of serious games in other contexts and in an e-Government context, then it presents the proposed model of using serious games in e-Government, with an overview of the use of serious games for effective e-Government services is presented. From there, an initial model is proposed that captures the use of serious games as external variables for both TAM and trustworthiness, and explains the intention towards engagement and actual use of e-Government services. Finally, the chapter proposes an integrated conceptual framework based on the above, which adopts the use of serious games to process and support fundamental TAM and trustworthiness external variables for achieving a high level of intention to use and actual citizen participation and involvement in e-Government services.

4.2 E-Government Adoption Success

Successful adoption of e-Government is a challenging task for any government; it is not simply transferring a demonstrably successful system from one context (i.e. country) to another, especially from developed to developing country, as each context of e-Government deployment has unique

requirements, with particular differences between developed and developing countries (Nkohkwo, and Islam, 2013). Practices and cultures have been flagged important cause of unsuccessful e-Government adoption, which has resulted in the identification of many barriers to implementation, including issues of citizen confidence, privacy and security; citizens' appropriate skills; and the acceptance of e-Government as an alternative to traditional governmental interfaces (i.e. bureaucratic systems) (Aladwani, 2016).

In addition, the digital divide issue in society is also a barrier against e-Government success in developing nations. As the primary users of e-Government services, citizens play a fundamental role in its success (Nkohkwo and Islam, 2013; Venkatesh et al., 2014). Therefore, public usage of e-Government services is a core factor of success. E-Government literature presents many previous studies that focused on the factors influence e-Government success that reflect its inherent complexity, with a noted emphasis on technological aspects. Some studies have examined decision makers' attitudes and political pressures, organisational and management, legal and regulatory, institutional and environmental barriers, but few studies have considered the users' perspective, such as citizens' perceptions of e-Government use (Olphert and Damodaran, 2007; Gauld et al., 2010).

Huge gaps in e-Government research still need to be filled to cover citizens' intention to use and to identify ways to build citizens' confidence in both government and technology. In some cases, e-Government experience user failure is a reason for citizens rejecting the use of the system, in spite of the systems being well presented in terms of technological aspects and project

development (Rana et al., 2015). Some e-Government variants such as mobile government (m-Government) were introduced to increase the availability of governmental services and raise citizens' engagement (Van Belle and Cupido, 2013), however more efforts are needed to consider the end users (citizens) regarding building their confidence and trust in using e-Services.

The factors that influence the successful adoption of e-Government covered in this study are discussed below.

4.2.1 Lack of IT Knowledge

Effective e-Government projects not only attract those citizens who already have IT knowledge, experience and who are connected to the Internet, but the government must likewise encourage all of its citizens to move to online services. To achieve this, literature has shown some suggestions such as advertising the new way of contact with the government (Moon, 2002; West, 2004; Dimitrova and Chen, 2006), and increasing digital literacy by providing courses within educational institutions (Bawden, 2008; Jaeger et al., 2012). However, these solutions are costly and not effective in the short terms (Morris, 2007; Jaeger et al., 2012). Therefore, a means of filling this huge gap requires more investigations, especially among developing nations. According to Morris (2007), e-Literacy refers to the lack of information and communication technologies used as a reason for low computer literacy. Thus, IT knowledge was included in the elements of proposed framework.

4.2.2 Lack of Experience in Using e-Services

In developing countries citizens are generally more familiar with face-to-face interactions in the transaction of official business (AlAwadhi and Morris, 2008), while studies have shown that internet experience is associated with levels of confidence of using e-Services (Chang and Chen, 2008; Colesca and Dobrica, 2008). According to Aiken and Bousch (2006), with higher levels of e-Services experience, particularly e-Commerce (such as online shopping), users gain sufficient knowledge of how to perform online transactions. Moreover, citizen's level of e-Services experience affects their tendency to trust the internet, and thus their level of trust in online transactions in general, including with official (non-corporate) bodies (Corbitt et al., 2003). Therefore, citizens' familiarity is a core element of their changes from the traditional way of government interaction to electronic means of communication. For this reason, experience in using e-Services was also of concern in this research.

4.2.3 Lack of Internet Trust

Obviously a lack of trust in the internet itself among users will fundamentally undermine any potential adoption of e-Government in developing countries (Carter and Bélanger, 2005). Trust in the internet mostly depends on levels of experience of using it, and security and privacy issues are factors that might prevent citizens from trusting the internet, and therefore using e-Government (Ebrahim and Irani, 2005; Palanisamy and Mukerji, 2012). Jaruwachirathanakul and Fink (2005) indicated that users' trust in e-Services and the internet in general is affected by the level of security and privacy emphasis provided to users. Therefore, the researcher in this study

considered internet trust as one of the main elements in the proposed framework.

4.2.4 Lack of Government Trust

Trust in government refers to citizens' trust in their local governmental institutions, in terms of provided service efficiency, effectiveness, transparency, reduced corruption and increased convenience. Research has shown that low levels of government trust among citizens lead to less willingness to engage in involvement of any kind, including e-Government (AlAwadhi and Morris, 2008). According to Blind (2007), governments must show a certain level of honesty, particularly in reducing of the importance of connections in developing countries. Both shaping and arising from the primacy of face-to-face interactions in the conduct of official business in developing countries, government service users in the Arab world habitually utilise patronage and nepotism networks known as *wasta* to transact their affairs (Fidler et al., 2011). While not a form of corruption *per se*, the prevalence of *wasta* does serve to entrench the role of interpersonal networks of power in important decisions and connections that pervade aspects of social and business tasks, which is clearly antithetical to the core role of e-Government, increasing accessibility (Hutchings and Weir, 2006). Government employees could resist and scupper attempts to implement e-Government if it is perceived to be a threat to them, thus they as well as citizens must be informed of the benefits of e-Government to provide services fairly and equally to the public. Hence, trust in government has to be included to increase public intention to participate in e-Government.

4.3 Benefits of Using Serious Games

There are numerous approaches to exchange information or thoughts with people in general using modern communication methods, one of the most effective of which is serious games, because of their impact and focusing on all age groups of citizens. Recently, the use of serious games in education, training, healthcare, safety, military and commercial has become a point of focus (Poplin, 2012; Ahmed et al., 2014). According to (Knight et al., 2010) using serious gaming can be utilised to deliver significant objects. Serious games are generally considered to increase various skills and they allow learners to practice scenarios that are impossible or difficult in the real-world due to cost, time and safety etc. (Guillén-Nieto and Aleson-Carbonell, 2012), (Haferkamp et al., 2011).

This study applies the benefits of using the serious games as a tool to encourage citizen participation and to raise the level of public trust in e-Services. In addition, it determines how best to utilise serious game technology to provide significant improvements that translate into better citizen invitations to use e-Government, especially in developing nations. Thus, this task becomes an integral factor in making the knowledge learning as exciting and interactive steps.

4.3.1 Learning

Sánchez and Olivares (2011) affirmed that serious games have a positive impact on learning activities, particularly problem-solving development and collaboration skills, perceptions of science improvement, and increased motivation for learning in the early stages of students' education (Mouaheb et

al., 2012). Moreover, serious games have been developed to cover diagnostic and therapeutic applications as well as health industry and health information systems; both are witnessing growing attention to and usage of serious games, including in the most critical professional context of healthcare (Connolly et al., 2012; Guillén-Nieto and Aleson-Carbonell, 2012). The content of serious games designed by specialists to fulfil the game purpose can demonstrably be used to deliver important information or messages to players (Gatzidis et al., 2009).

4.3.2 Training

The training of soft skills in technical settings has become more and more important for an effective communicative exchange between citizens in any community. Serious game training-based technology enables users to train in a virtual environment under safe conditions in the form of mobile apps to improve soft skills literacy (Smith et al., 2015). Moreover, it maintains high user motivation on the one hand and provides opportunities to “learning through doing" on the other (Guillén-Nieto and Aleson-Carbonell, 2012). This combination of entertainment and simulation offers a fruitful framework for education and training purposes. Serious gaming has been used in different types of training such as group decision-making processes, emergency management and military applications (Poplin, 2012). Furthermore, risk management and disaster communication training have been implemented using serious games (Haferkamp et al., 2011).

4.3.3 Confidence

As accentuated previously, confidence has a major effect on an individual behaviour. One of the advantages of serious games, providing a repeatedly safe, low-cost environment allowing users practice and familiarise themselves with tasks. Serious game technologies with public participatory tools represent one of the latest innovations in this area (Mouaheb et al., 2012). According to Guillén-Nieto and Aleson-Carbonell (2012), serious games introduce a shift from a model of instruction based on listening to a model of instruction based on doing and interaction. Therefore, utilising serious games technology in the context of e-Services would provide a great opportunity for practicing services in a virtual environment to avoid misuse, increasing confidence among users with less knowledge or skill in using e-Services.

4.3.4 Awareness

In this study awareness refers to cultural awareness, particularly recognising ourselves as part of a community improvement. In the adoption of e-Government G2C, citizens are the end users of services, therefore it is important to achieving successful adoption to make the public aware that they can take part in the services, and that they can benefit from improved communication with their governmental agencies. E-Government is associated with the promotion of transparent and accountable government, thus governments adopting such strategies should inform citizens of this, as part of efforts to increase public awareness. Serious games have been used successfully in public awareness campaigns such as crisis management (Rebolledo-Mendez et al., 2009). According to Djaouti et al. (2011), six typologies are used in serious games, including serious intentions such as an

increase in awareness, simulation, training, informing, teaching and influencing.

To conclude, with the growing attention and use of the gaming industry for non-entertainment purposes, serious games and game-based learning technologies have brought undeniable benefits to all fields in which they have been deployed. Therefore, it is clearly necessary to understand how the use of serious games affect, benefit and improve the quality of e-Services.

4.4 Proposed Model of Using Serious Games in e-Government in Developing Countries

Governments in developing countries are increasingly willing to accept the use of new technologies as an important segment of their e-Government programs to avoid failure. Therefore, as a part of this PhD programme, a tentative model is proposed that aims to show possible links between serious games and improving e-Government in Figure 4.1 (Ahmed et al., 2014). The model prepared to seek for achieving better public participation and better-trained employees in a developing country context.

Basically, the model is built to develop and discuss the third stage (Building Trust) of Nine-Stage Model, developed by Zarei et al. (2008), to implement e-Government in developing countries. The proposed branch to the model shows four key variables of the serious game that benefit from an e-Government perspective

1. Linkages in terms of G2C and G2G, focusing on citizens and government employees, through expanding knowledge and training.

2. The need to eliminate or minimise lack of citizen participation and lack of knowledge among employees, as serious games aim to support learning processes in a new more playful way.
3. Serious game technology applications supporting learning effectiveness, creating a more effective user experience and training purpose for an efficient workforce.
4. Citizen empowerment by increased efficiency in service delivery and improvements in areas such as participation, responsiveness, government finance and better e-Government.

The model also demonstrates the environmental and technical factors in the use of serious games, such as political, cultural, legal and sustainable development. In addition, the model emphasises that the use of serious games may face a number of challenges, such as cost pressures; lack of long-term vision and political commitment, together with indecisiveness in priority-setting; game infrastructure, including the digital divide; and a lack of public awareness about the use and benefit of use this tool and legal requirements.

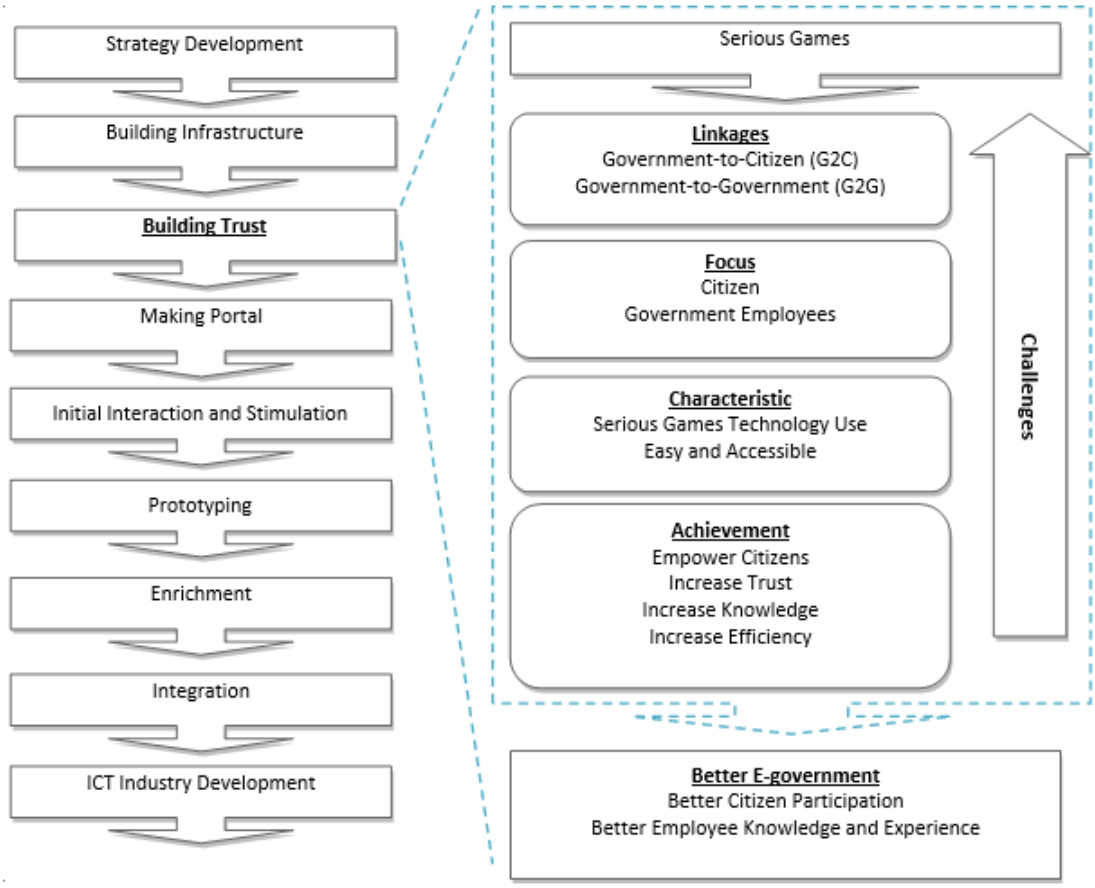

Figure 4.1: Proposed model of using serious games in e-Government in developing countries (Ahmed et al., 2014)

The proposed model provides some guidance to e-Government developers to use serious games as tools to increase public participation and easily train employees with respect to the nature of the trust-building stage. As the relevant issues are identified and discussed, it will provide them with a better understanding of the challenges and opportunities of introducing serious game technology from an e-Government perspective. It also offers researchers and academics the prospect of conducting empirical research to validate or further enrich the model. The proposed model considers the main benefits and challenges of using serious games in the trust-building stage, which is particularly important in developing countries. Such initiatives often face important challenges that may include lack of long-term vision and political commitment, lack of game infrastructure including the digital divide

and indecisiveness in priority-setting. Strong political commitments with a well-planned and systematic use of serious games within the e-Government development model could help overcome these challenges. In addition, the model underscores the importance of the environmental and technical variables and their impact on the use of serious games to improve e-Government services.

4.5 An Overview of Serious Game for Effective e-Government Service

The concept of a serious game and its usability and applicability in a public participatory process for effective e-Government service overview was illustrated in advance of this thesis by (Ahmed et al., 2014) in Figure 4.2. The game should consider and include five main elements:

- Environment

The game environment concentrates on the location, economic, infrastructure, and public size in addition to user readiness and user willingness (e.g. citizens, business and government).

- Objectives

The objectives in the game include saving training costs, empowering citizens, and increasing trust, knowledge, efficiency, awareness, participation, confidence, and practice.

- Goals

The goal of such serious games is to improve e-Government access and services in developing countries as well as, reduce the cost of staff training.

- Rules

The rules of the game define how it can be played, based on the purpose of the game, and whether it is for training or participation.

- Player

The game should be designed for both individual and multiple players who interact with e-Government portal and other users.

In this type of game, the player may include government employee, government officers and citizens of all age groups.

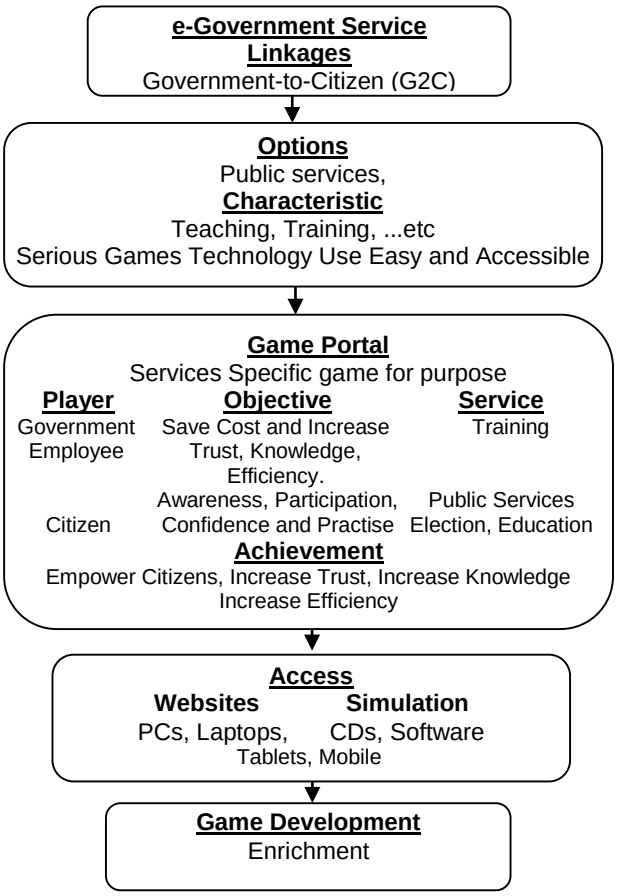

Figure 4.2: Overview of serious game for effective e-Government service (Ahmed et al., 2014)

4.6 Initial Proposed Research Framework

A comprehensive review of the literature of technology acceptance and user behaviour included several models and theories that attempt to predict and explain user intention, including the Unified Theory of Acceptance and Use of Technology (UTAUT) and its extended model (Venkatesh et al., 2011), the Theory of Reasoned Action (TRA) (Fishbein, 1979), TAM (Davis, 1989), the Theory of Planned Behaviour (TPB) (Ajzen, 1991), the combined TAM and TPB (C-TAM-TPB) used in internet banking research (Safeena et al., 2013), the Model of PC Utilization (MPCU) (Thompson et al., 1991), Diffusion of Innovations (DOI) (Rogers, 2010), and TM that was used to examine the users' level of trust (Gefen and Reychav, 2014). Each of these models uses a variety of independent variables to explain and predict user behaviour.

Based on these theoretical models, an initial framework was developed by (Ahmed et al., 2015), as a part of this research, as shown in Figure 4.3. The initial framework captures the use of serious games as external variables for both TAM and TM. The selection of TAM and TM is based on them being the most suitable models that inspect user acceptance from a user-centric perspective, and both of them depend on external variables pertinent to the use of serious games. Considering the benefits of utilising serious games in training and education, the same impacts tested in training and education research are expected to be present in the context of e-Services. This framework follows TAM and TM and explains the intention towards engagement and actual use of e-Government services by assuming four angles: perceived usefulness, perceived ease of use, the trust of the Internet and trust of government.

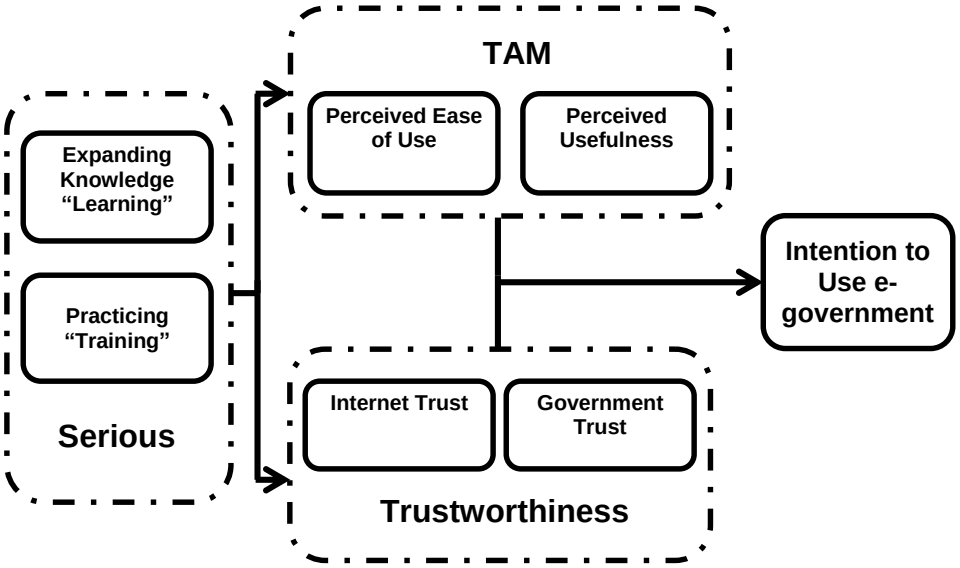

Figure 4.3: Initial proposed research framework (Ahmed et al., 2015)

i. *Perceived usefulness:* serious games would provide advantages of expanding user knowledge regarding e-Government services' availability and reliability. Furthermore, users discover benefits of services, which intrinsically encourage intention of involvement.

ii. *Perceived ease of use:* the use of serious games in training has undeniable advantages in several fields such as medical treatment, emergency management, military, etc. Similarly, citizens gain practice, familiarity and learn how to perform and instil motivation through experiencing e-Government services within a game.

iii. *Internet trust:* citizens have different perceptions of the trustworthiness of technology, especially the internet, based on their knowledge and experience. Using serious games to expand technology knowledge and covering privacy and security barriers would raise user ability to operate confidently.

iv. *Government trust:* public trust in their state government is a controversial topic that depends on many factors beyond the purview of e-Government research. However, serious games could provide an opportunity to build some trust between citizens and government authorities by keeping users well-informed and updated about services provided by the latter. For successful e-Government adoption, governments obviously have to play a key role in explaining privacy and security issues and guaranteeing political decisions in the benefit of all citizens.

All these factors reveal a general support for serious games as a determinant of citizen engagement in e-Government.

An overview of a serious game for increasing citizen engagement in e-Government services was characterised as shown in Figure 4.4 by (Ahmed et al., 2015). It illustrates the process and values of using serious games, starting by advertising e-Government services and their benefits to citizens through providing full knowledge. This is followed by learning how to perform with the services then practicing, which increases confidence and changes beliefs and behaviours in e-Services. Therefore, the level of trust in government and online services is achieved through understanding the rules of privacy and security. Finally, all of these processes would lead to instilling motivation, increasing public awareness, and motivating citizens to take action.

Figure 4.4: Overview of serious game model for increasing citizen engagement in e-Government service (Ahmed et al., 2015)

4.7 Conceptual Framework

The whole previous discussion leads the researcher to develop an integrated detailed conceptual framework shown in Figure 4.5. The conceptual framework applies the benefits of using serious games as a tool to support the external variables for TAM and TM for attaining a high level of user intention and actual citizen participation and involvement in e-Government services addressed in the aim of the research. This framework has classified how serious games could fulfil users' needs in developing countries. Therefore, the use of serious games in the four elements of the framework can be described as follows:

4.7.1 Perceived usefulness

A. Expanding Knowledge: The use serious games for expanding user knowledge regarding e-Government services, intending to improve users' beliefs regarding changing to a new way of government contact rather than personal face-to-face communication. This new knowledge would support the perceived usefulness that encourages citizens' IU.

B. Discovering Benefits: The use serious games to allow users to discover e-Services benefits regarding e-Government availability, reliability, cost and time saving, and reducing corruption. Benefits seen would have a positive impact on the perceived usefulness, which would increase IU.

4.7.2 Perceived ease of use

A. Practice, Learn How to Perform: Serious games are well known in the field of training, thus their use provides a great opportunity for citizens to try e-Service simulation to learn how to perform in the use of actual service. Practicing e-Government in a game would have an advantage on the perceived ease of use then, user intention to participate.

B. Familiarity, Instilling Motivation: Familiarising users with e-Service in terms of interfacing and interacting with government services within a game would encourage them and build self-confidence, thus supporting the perceived ease of use and increasing willingness to use the actual system among immediate users and their social networks.

4.7.3 Internet trust

A. Practice, Learn How to Perform: Users have different perceptions of the trustworthiness of the internet based on their experience. Technological information provided using serious games, including privacy and security barriers, would raise user ability to operate confidently.

B. Familiarity, Instilling Motivation: The use of serious games would intrinsically familiarise users with online services and its advantages regarding e-Government availability, cost and time saving, and fair and equal service. Therefore, encouragement would be gained that raises citizens' trust to use e-Government.

4.7.4 Government trust

A. Expanding Knowledge: The use of serious games could allow an opportunity to build some trust between citizens and their government when citizens are informed and updated about services provided by government agencies, as well as indicating how the government endeavours to increase transparency and improve service.

B. Discovering Benefits: Governments clearly have to play a key role in explaining privacy and security issues and guaranteeing political decisions in the benefit of all citizens. Hence, using gaming for delivering information to the public would open a new road to increase trust.

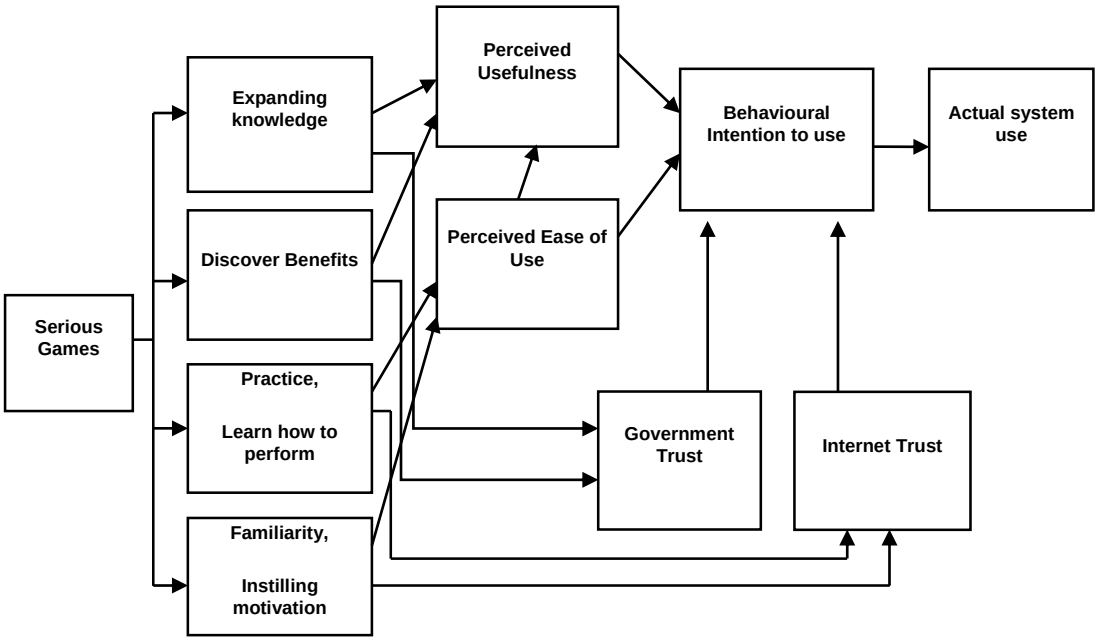

Figure 4.5: Proposed conceptual framework

All previous features create a general belief that support of the use of serious games in the proposed framework provides new tools to improve citizens' intention to participate and engagement in e-Government, therefore more effective e-Government can be achieved with less probability of failure.

4.8 Summary

This chapter discussed factors in the successful adoption of e-Government as well as possible use of serious games technology to increase its effectiveness. It then proposed a model for using serious games in e-Government implementation in developing countries, followed by an overview of how the use of serious games leads to effective e-Government. Moreover, this chapter reviewed several models of technology acceptance and user behaviour to justify the adoption of TAM and TM, finishing with a conceptual framework for empowering citizen engagement in e-Government in developing countries.

5 Hypotheses and Survey Questionnaire Development

5.1 Introduction

This chapter discusses the field study conducted to fine-tune the initial research model and develop it into a comprehensive research model in the context of Libya. As shown in the model (Figure 4.3), a more comprehensive framework on increased citizens' intention to participate in e-Government is offered by this study. As highlighted before, this research investigates the influence of the use of serious games on the success of e-Government systems. The current study also examines the mediating role of 'trust in e-Government'. Referring to the research model, this chapter discusses the development of hypotheses, which are justified by the relevant literature. The hypotheses describe the relationships among the constructs as proposed in the model.

The development of the questionnaire as the survey instrument in order to test the hypotheses is also presented following the hypotheses development. The structure and format of the questionnaire are explained in this chapter, and the measurement items are supported by previous studies as well as the results from the field study. The questionnaire is presented in (Appendix B).

5.2 Hypotheses

The literature shows that many scholars have tested the effect of Perceived Ease of Use (PEoU) and Perceived Usefulness (PU) and relations between them and actual use (Carter and Bélanger, 2005; Lean et al., 2009; Farahat, 2012; Cegarra-Navarro et al., 2014). Likewise, trust in government and in the

internet are agreed to have a clear effect on user intention of use (Karunasena et al., 2011; Shareef et al., 2011; Alawneh et al., 2013). Therefore, this study focuses on the effect of the external variables as they are the core factors of both models (TAM and TM), thus the research framework was developed to concentrate on the benefits of using serious games as a tool to address the external variables shortages. The comprehensive proposed framework shown in Figure 4.5 argues that the use of serious games based learning and expanding knowledge and the use of serious games based practicing and training would have positive effects to improve all PEoU, PU, InT and GT which will lead to intention to use.

5.3 Hypotheses Development

5.3.1 Hypotheses Related to the Perceived Ease of Use

In this study, the lack of citizens' intention to use is defined as lack of willingness among individuals, households and businesses to participate in existing opportunities to access governmental ICTs. Based on the definition, a more comprehensive understanding of the citizen participation is proposed by two categories: the practice and learn how to perform and familiarity and instilling motivation. The PEoU hypothesis in many previous studies related to e-Services contexts tested or investigated the relationship between ease of use and user satisfaction (Shareef et al., 2011; Alawneh et al., 2013), whereas in e-Commerce, Eid (2011) noted that consumer sensitivity to satisfaction level reduced with the increase of complication and difficulty of using the service. Similarly, Carter and Bélanger (2005) and Shareef et al. (2011) found evidence of an interaction between ease of use and user

satisfaction. Farahat (2012) showed that familiarity is an important moderator to increase users' intention to participate.

Consistent with these studies, it is expected that PEoU in e-Services may lead to higher intention to use. On the other hand, serious games have recently been used for different purposes such as education and training (Buckley, 2003). It is proposed that four learning categories can be support by serious games: personal skills, interpersonal skills, applied ethics and social awareness. Two main reasons lead to accessibility of the use of serious games in various industries: providing a strong proof-of-concept and an endorsement of learning efficiency; and providing a reachable, low-cost tool for learning (Sharifi and Zarei, 2004). To sum up, the use of serious games in learning and training has undeniable advantages in many fields, such as medical treatment, emergency management, military etc. Similarly, citizens would gain practice, familiarity and learn how to perform and instill motivation through experiencing e-Government services within a game, which leads us to derive the following hypotheses:

> ***H1a:*** *Learning and expanding knowledge through playing serious games is positively related to higher levels of Perceived Ease of Use.*
>
> ***H1b:*** *Practicing and training through playing serious games is positively related to higher levels of Perceived Ease of Use.*

5.3.2 Hypotheses Related to the Perceived Usefulness

The literature has clearly pointed the positive relation between understanding the benefits and user satisfaction in e-Services. In the e-Commerce context,

studies have widely tested the relationship between the consumer satisfactions and benefit dimensions (Eid, 2011). For example, Lee and Lin (2005) agreed that one of the main factors in customer satisfaction is website appearance. According to Teo et al. (2008), in increasing the level of user satisfaction, increasing the level of system and service quality and the ease of usage are the most significant elements. Belanche et al. (2012) agreed that perceived usefulness is an important reason for overall satisfaction. This concludes that users' understanding of benefits and system usefulness in terms of cost and time saving is positively related with their satisfaction level. Playing serious games related to e-Government services would provide advantages of expanding user knowledge regarding services' availability, reliability, cost and time-saving. Furthermore, users discovering service benefits would encourage their intention of involvement. Therefore, the following hypotheses were proposed;

H2a: *Learning and expanding knowledge through playing serious games is positively related to higher levels of Perceived Usefulness.*

H2b: *Practicing and training through playing serious games is positively related to higher levels of Perceived Usefulness.*

5.3.3 Hypotheses Related to the Internet Trust

Generally, trust is a psychological and social phenomenon, but in an IT context trust stands as a key mediating variable between information quality and information usage, with important consequences for both customers and service providers (Kelton et al., 2008). However, trust is believed to be an

important factor in the area of ICT (Bélanger and Carter, 2008; Kelton et al., 2008; Teo et al., 2008). Srivastava and Teo (2009) argued that trust positively influences IU and suggested that trust in e-Government adoption and usage is based on two elements: trust in government and trust in internet technology. Furthermore, they stated trust in e-Government is a “belief that the e-Government services can be used to get the desired outcome satisfactorily” (Srivastava and Teo, 2009). Moreover, the trustworthiness of technology and the internet can be perceived very diversely among citizens, according to differing levels of experience and knowledge in an e-Commerce context; however, it is clear that perceived risk negatively influences users' attitudes and satisfaction, therefore it negatively affects users' intentions to use online services (Osman et al., 2014). In an e-Government context, it was suggested that perceived risk will have the same effect on e-Government intentions to use (Carter and Bélanger, 2005; Alawneh et al., 2013).

Using serious games to expand technology knowledge and covering privacy and security barriers would raise user ability to operate confidently (Ahmed et al., 2015). Citizens would be more likely to use e-Services if they knew about privacy and security protocols used to protect information they disclose or share online. Based on the aforementioned literature, and in the light of users' reluctance to switch from traditional interaction with government and the need for a better understanding of the impact of risk perceptions on user satisfaction, we proposed the following hypotheses:

> ***H3a:*** *Learning and expanding knowledge through playing serious games is positively related to higher levels of Internet Trust.*

H3b: *Practicing and training through playing serious games is positively related to higher levels of Internet Trust.*

5.3.4 Hypotheses Related to the Government Trust

An e-Government system is a tool that allows governments to provide public services for citizens and businesses (Srivastava and Teo, 2009). Therefore, if a government shows honest care for its citizens and is able to effectively conduct its services, citizens are high likely to consider that the e-Government services offered and run by the state are able to serve their needs. Public trust in their state government is an immensely complex and controversial topic (Bélanger and Carter, 2008; Ahmed et al., 2015). In developing countries such as Libya, which is exceptional in many obvious ways, it is important to concentrate on the influence of trust in government for e-Government success.

This research will investigate if the use of serious games could improve trust in government in the e-Government services context. However, regarding e-Government, serious games could provide an opportunity to build some trust between citizens and government authorities by keeping users well-informed and updated about services provided by the latter (Ahmed et al., 2015). For successful e-Government adoption, governments obviously have to play a key role in explaining privacy and security issues and guaranteeing political decisions in the benefit of all citizens, in addition to explaining how e-Government services improve transparency and reduce corruption. All these factors reveal a general support for serious games as a determinant of citizen engagement in e-Government. Building on these two facts and to generalise

the impact of opportunity on user satisfaction, the following hypotheses are proposed:

H4a: *Learning and expanding knowledge through playing serious games is positively related to higher levels of Government Trust.*

H4b: *Practicing and training through playing serious games is positively related to higher levels of Government Trust.*

5.3.5 Summary of Hypotheses Development

Overall there are four pairs of hypotheses describing eight relationships based on the comprehensive research framework proposed earlier in Figure 4.5. The hypotheses are presented in Table 5.1, and clearly illustrated in Figure 5.1.

Table 5.1: Summary of hypotheses statements

Construct	Link	H#	Hypotheses Statement	Measured Variables
Perceived Ease of Use	LE(SG) → EU	H1a	Learning and expanding knowledge through playing serious games is positively related to higher levels of Perceived Ease of Use	Clear Understandable Familiarity
	PT(SG) → EU	H1b	Practicing and training through playing serious games is positively related to higher levels of Perceived Ease of Use	How to interact Interact Quickly know requirement
Perceived Usefulness	LE(SG) → PU	H2a	Learning and expanding knowledge through playing serious games is positively related to higher levels of Perceived Usefulness	Knowledge Benefits
	PT(SG) → PU	H2b	Practicing and training through playing serious games is positively related to higher levels of Perceived Usefulness	Save time and cost Reliability
Internet Trust	LE(SG) → IT	H3a	Learning and expanding knowledge through playing serious games is positively related to higher levels of Internet Trust	Data protection Security level Data privacy
	PT(SG) → IT	H3b	Practicing and training through playing serious games is positively related to higher levels of Internet Trust	Process practice Familiarity
Government Trust	LE(SG) → GT	H4a	Learning and expanding knowledge through playing serious games is positively related to higher levels of Government Trust	Who accessed Well-informed
	PT(SG) → GT	H4b	Practicing and training through playing serious games is positively related to higher levels of Government Trust	Transparency Equality

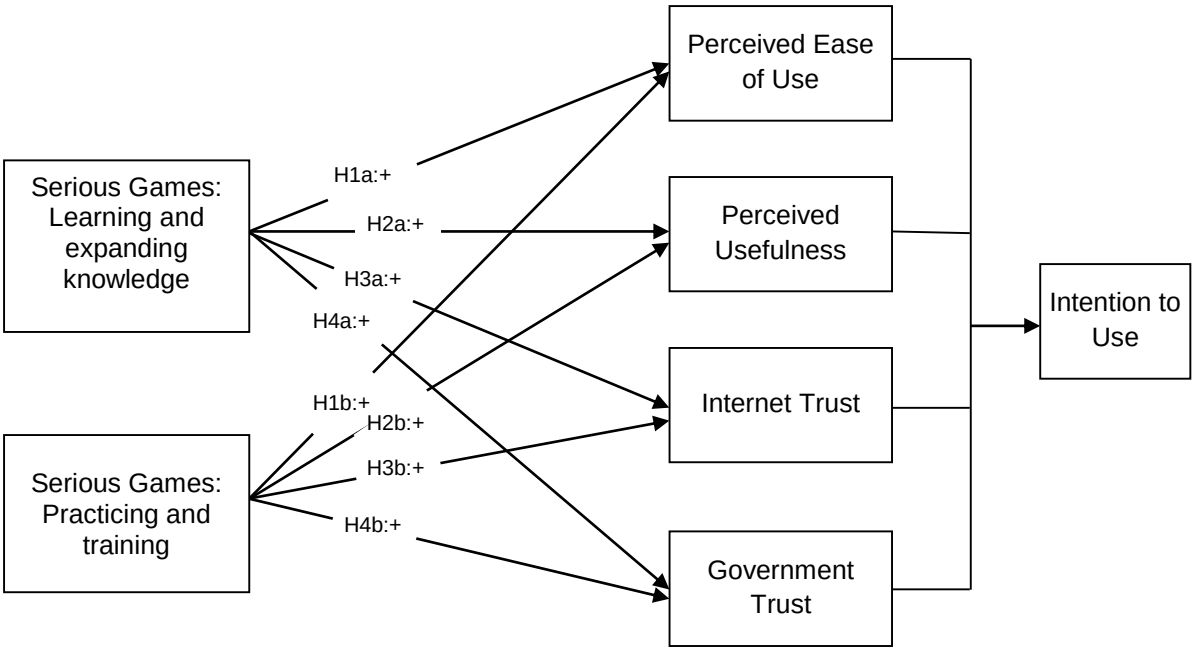

Figure 5.1: Research model hypotheses

5.4 Measures and Instrument Development

To test the proposed framework in the most realistic possible way, a survey was conducted with a broad variety of citizens at community events in Libya. To reflect the conceptual framework, the survey was designed based on a structured self-administered questionnaire instrument for data collection to validate research model depicted in Figure 5.1, with items designed to cover the four main elements of the framework (PEoU, PU, InT and GT). The development of the survey was designed after applying the Moore and Benbasat (1991) process, whereby questions were compiled from validated instruments in the literature to represent each construct, and wording was modified to fit the use of serious games in e-Government context. Table 5.2 shows the constructs, definitions and relevant studies since items were adapted from previous studies. Five-Point Likert-type category-scaling format

was used to measure the scale items (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree).

Table 5.2: Construct definitions and references

Construct	Definition	References
Serious games to achieve PEoU	Playing e-Government serious games based learning and training improves PEoU	(Carter and Bélanger, 2005; Knight et al., 2010; Poplin, 2012; Ahmed et al, 2014; Cegarra-Navarro et al., 2014)
Serious games to achieve PU	Playing e-Government serious games based learning and training improves PU	(Carter and Bélanger, 2005; Haferkamp, 2011; Sánchez and Olivares, 2011; Connolly, 2012; Guillén-Nieto and Aleson-Carbonell, 2012; Cegarra-Navarro et al., 2014)
Serious games to achieve InT	Playing e-Government serious games based learning and training improves InT	(Carter and Bélanger, 2005; Bélanger and Carter, 2008; Teo et al., 2008; Gatzidis et al., 2009; Lean et al., 2009; Srivastava and Teo, 2009; Bellotti et al., 2010; Eid, 2011; Osman et al., 2014)
Serious games to achieve GT	Playing e-Government serious games based learning and training improves GT	(Carter and Bélanger, 2005; Teo et al., 2008; Srivastava and Teo, 2009)

The framework takes into account issues previously discussed and integrates constructs from various fields, including information systems, sociology and public administration. The framework is more comprehensive than individual theoretical study and attempts to capture the complex relationships involved in e-Government. Considering benefits that the use of serious games has provided to education and training, the same level of success is expected in using serious games in e-Government.

5.5 Survey Questionnaire Development

A questionnaire was developed based on previous research and the relevant literature in order to conduct the survey for this study (Appendix B). Its structure was designed in a format amenable to the easy comprehension of respondents, and to avoid response bias. As suggested by Rattray and Jones

(2007) and Radhakrishna (2007), the questionnaire contained the components described below.

5.5.1 Survey Introduction

The statement in the introduction described the topic of the research briefly, the objectives of the research and information for the respondents. The information included the approximate time it should take to complete the questionnaire, a statement that the participation was voluntary, and that the information was confidential and anonymous. The researcher in attendance also provided general instructions on how to answer the questions, followed by brief definitions of some key terms.

5.5.2 Computer Knowledge

Computer knowledge was positioned at the beginning, in the initial questions, as these questions were thought to be a factual question and ease to answer for example, “How often do you use the computer?” Thus they served as warm-up questions for those that followed.

5.5.3 Internet Knowledge

Following computer knowledge, the second factual questions on internet knowledge required direct answers, such as “Where do you mainly use the internet?” These questions were thought to be a natural continuation from computer knowledge, thus they were positioned early in the questionnaire to serve as an additional warm-up for respondents.

5.5.4 Government Services Experience

In this part of the questionnaire, participants were asked about their experience with governmental services and how often they normally have

contact with government agencies, as well as ways of communication, for example “How often do you contact a government agency/service provider?”

5.5.5 E-Services Experience

In this part participants were asked about their e-services experience in general, such as “Why/How often do you use government/service provider’s websites?” These questions were designed to focus participants’ attention on the main topic of the questionnaire.

5.5.6 Trust in e-Government

This section was a critical part of the questionnaire focused on the level of trust and confidence in e-Services and eLibya in particular. These questions were designed to solicit participants’ opinions after a brief introduction included to describe the section and the format to answer its questions.

5.5.7 Game Experience

This section was positioned in the middle of the questionnaire, after trust in e-Services and before intention to play e-Government serious games, for two reasons. The first was the novelty of asking game-related questions, to mentally refresh the participants. The second is that game experience questions are easy-to-answer factual questions, for example “How often do you play electronic games?” Thus this speed up the process of the questionnaire to maintain participants’ interest.

5.5.8 Intention to Play e-Government Serious Games

This part was the core of the questionnaire and solicited the views or opinions of the respondents about statements provided with a five-point Likert scale (ranging from 1=Strongly disagree to 5=Strongly agree). This format allows

the respondent to give a positive, neutral or negative response to allow the most genuine views of respondents to be reflected, including if they were undecided or had no strong opinion (‘neither agree or disagree’).

5.5.9 Demographics

The demographic information was positioned at the end, in the last questions, to avoid projecting categorisations on respondents from the beginning, and to allow them to answer the survey regarding their experiential knowledge rather than internalisation of their demographic profile characteristics. Therefore, these questions were thought to be the easiest to answer and that they would serve as an easy and quick finish.

5.5.10 Closing Statements

The closing statements in the questionnaire thanked the respondents for their participation and contained a statement inviting them to use the contact details provided if they required additional information or had any questions.

5.6 Summary

This chapter presented the development of the hypotheses together with the rationale and justification derived from the comprehensive research model previously developed. There are four pairs of hypotheses concerning eight relationships among the variables, as proposed in the model. This chapter also described the development of the questionnaire and measurement items. To test the developed hypotheses, the questionnaire was developed based on prior literature along with findings in the field study. The final questionnaire was then distributed for a national survey.

6 Framework Validation

6.1 Introduction

This chapter describes the results of interviews conducted as part of the preliminary investigation of Libyan e-Government. In addition, it presents the results of a survey-based study that was conducted to validate empirically the proposed theoretical framework based on TAM and TM to improve the effectiveness of e-Government by the use serious games for empowering citizens' intention to participate.

This chapter discusses the research hypotheses, objectives and the survey-based adoption. Three parts of the quantitative analysis are detailed: examination of respondents' level of trust in using e-Services; analysis of their gaming interest and experience; and assessment of the moderating effect of using serious games for learning and training on PEoU, PU, InT and GT. Collected data analysis and results are presented in addition to measures of validity and reliability of constructs, finishing with hypotheses testing and results.

6.2 Preliminary Investigation Study

This section describes the preliminary investigation study with the purpose of exploring the stage of Libyan e-Government development as well as the main barriers and challenges that the project faces. For that, interviews were conducted with official Libyan government officers involved in the implementation of the current project. Interviews enabled the researcher to enhance the effective factors identified from the literature to the reality of the

context of Libya. This stage leads the researcher to focus on the most influential barriers of low citizens' participation as a core issue in the research context. The result of this study was useful for establishing the theoretical framework, which was validated using a survey-based data collection.

The first interview participant is an e-Government developer holding the position of manager of the e-Government project in the Libyan government. Clearly it was found that conducting a meeting with him would be the best in terms of ascertaining the management/ provider perspective. The second interview participant was a policy maker, who was deputy prime minister in the Libyan Interim Government (2012-2014). Therefore, he was chosen to address the governmental point of view in this project and the government vision, plan, and programme to address e-Government goals. Furthermore, he is an expert in e-Services who has published several conference and journal papers. Both interviews were conducted at the interviewees' offices. The third interview participant was an ICT Manager holding the position of Executive Director for eLibya. He was chosen because of his interest in exploring which technologies the Libyan government is intending to use to make this project exist. As he was abroad at the time of data collection, the interview was conducted via Skype.

6.2.1 Objectives of the Preliminary Investigation

This study had several specific goals when these interviews were approached. One of the main aims of this study is to learn more about the current processes of development of e-Government in Libya. Additionally, it seeks to define issues faced by the Libyan e-Government team during the

development of the current project. Consequently, semi-structured interviews were conducted to achieve those goals, as well as the following objectives:

- Determining how the e-Government initiative programme in Libya is planned.
- Exploring the impression of the interviewees about e-Government project in Libya, how they rate its success and difficulty, and why.
- Determining the factors of e-Government effectiveness in Libya.

The responses of the interviewees assisted in identifying the barriers to achieving successful e-Governments systems besides establishing an initial framework for addressing e-Government challenges that affect e-Government systems success.

6.2.2 Interview Questionnaire Development

The three main objectives of the investigation study were included in the six interview questions (two main questions for each objective). The interview guide is presented in (Appendix A). The first part explores the Libyan e-Government target and current stage of development. The second part investigates the level of success and difficulties that the current project is facing. The last section determines factors that affect successfully implementing e-Government in Libya. A brief description of questions is presented in Table 6.1.

Table 6.1: Description of interview questions

Section	Question Description
E-Government target and current stage of development	Government main goals, plan, scope, and strategy
	Current stage, achievement,
Success and difficulties	Rate level of success
	Challenges (management, technical, others)
Factors in successful implementation	Issues of e-Government in Libya
	Adoption concerns

6.2.3 Interview Outcomes

After the generation of initial codes, themes and sub-themes were categorised and reviewed. The thesis focused on the most effective identified themes concerning e-Government implementation in the Libyan context. Moreover, this focus would address the research question that seeks to identify the factors influence Libyan citizens' acceptance and adoption. For that, the themes of citizens' knowledge, adoption and experience of e-Government would be discussed in details.

6.2.3.1 E-Government Adoption

This theme represents the participants' impressions regarding citizen adoption reduction of e-Government in Libya. Two important sub-themes were identified:

A. Citizen trusts in government

Participants believed that trust is one of the most important aspects of the implementation of e-Government strategies. Without trust, citizens will not participate in the e-Government process. For instance, interviewee 1 stated:

> *"Currently, our citizens are not willing to involve in any government activity because of true and fake stories regarding conflicts, corruption and nepotism".*

B. Citizen trust in e-Services and the internet

In order for e-Government to achieve its ambitious objectives to develop and deliver high quality and integrated public services, citizens need to trust the virtual environment:

> *"The government has noticed that not many citizens are using the available e-Government facilities". (Interviewee 2)*
>
> *"The e-Government project has already started initial stages of implementation and several governmental websites are available. However, the number of users has not reached the target goal that the project is seeking". (Interviewee 3)*

Thus, factors that impact the building of trust needs to be investigated, such as pre-interactional and interactional factors of e-Government in the Libyan case. Consequently, this research considered the focus on those points in the research stage two of framework building and validation and research stage three of development and testing of a serious game artefact.

6.2.3.2 Knowledge and Experience

This theme describes the participants' concerns regarding citizen unwillingness to participate in e-Government in Libya. It includes:

A. Paper-based transaction

Libya has a long experience of paper-based bureaucratic transactions between the government and citizens. For the public, paper-based and face-to-face interactions are the default experiences of government.

B. Self-confidence

The end users of any e-Government service are citizens. Therefore a certain level of confidence is required on their part to adopt and participate in online transactions.

C. Lack of knowledge

Understanding the benefits of e-Government is an important factor that encourages users to participate. In the Libyan context, e-Government is quite a new concept for the public. For example, interviewee 3 mentioned:

> *"If people know the benefits of e-Government in terms of time and cost saving and reducing of corruption they will prefer to use it".*

6.2.3.3 Political situation

The study has shown that there is a big challenge facing the successful implementation of e-Government in Libya. Since 2011, the political instability in the country has been a major barrier to any government actions.

A. Management issue/conflicts

Interviewees 1 and 2 mentioned that the political instability of the country and government inertia causes delays and conflicts within the project.

6.3 Developing Appropriate Hypotheses

Many governments in developing countries are keen to adopt e-Government by providing information and services in a more easy and effective way by means of online services. Therefore, governmental websites attempt to improve their way of information and services delivery over the internet (Haidar and Abu Bakar, 2012). However, a lack of citizen participation is still a

challenging issue to achieve successful adoption of e-Government among developing nations.

Many studies show that in the TAM, PU and PEoU have a strong relationship with IU (Farahat, 2012; Susanto and Goodwin, 2013; Cegarra-Navarro et al., 2014). Similarly, in TM, trust in online services and trust in service providers also have a role to play on willingness to use e-Services (Gefen and Reychav, 2014; Fakhoury and Aubert, 2015). However, both of these models depend on external variables such as knowledge, familiarity, and experiences.

In this study, serious games were proposed as a tool to address these external variables. As explained in section 5.3, TAM has four constructs which were considered: serious games for learning and expanding knowledge provides PEoU, serious games for practicing and training provide PEoU, serious games for learning and expanding knowledge provides PU and serious games for practicing and training provide PU. The TM also includes four constructs: serious games for learning and expanding knowledge provides InT, serious games for practicing and training provides InT, serious games for learning and expanding knowledge provides GT, and serious games for practicing and training provides GT.

These hypotheses focus on the effect of the use of serious games to support the external variables as they are the core factors of both models (TAM and TM). Thus, hypotheses were developed to concentrate on the benefits of using serious games as a tool to address the external variables shortages among citizens of developing nations, taking Libya as a case. The Research Model Hypotheses shown in Figure 5.1 argue that the use of serious games

based learning and expanding knowledge and the use of serious games based practicing and training would have a positive effect on improving PEoU, PU, InT and GT, promoting intention to use.

6.4 Survey-Based Study

The survey method was used in this stage of the research to collect data for the proposed framework's validation. This method is consistent with many studies that aimed to replicate the TAM and trustworthiness in several contexts (Shareef et al., 2011; Farahat, 2012; Alawneh et al., 2013; Susanto and Goodwin, 2013; Cegarra-Navarro et al., 2014). Moreover, in terms of generalizability, quantitative surveys methods are considered as having more advantages than qualitative methods (Johnson and Duberley, 2000). Additionally, the study in this stage is consistent with IT and CS research literature, which generally applies survey-based studies to test hypotheses (Hazzan et al., 2006; Urbach et al., 2009). In other words, surveys for the aims of data collection are widely used by hypotheses-testing study in literature.

6.5 Data Analysis and Results

6.5.1 Survey Questionnaire

The questionnaire was distributed in three locations where community events were taking place, and copies were given to random respondents. After the survey introduction, which clearly stated that participation was voluntary and the information disclosed would be confidential and anonymous, the outcomes included the following.

6.5.1.1 Demographics

Table 6.2 below shows the samples' demographic characteristics, including gender, age, living area, education, occupation and income. In the actual study the instrument was administered to 130 citizens at a community concert. Of the 130 administered surveys, 106 were completed and used in the analyses. The ages of the subjects ranged from 15 to 65 years, with 80% falling in the middle range of 25-44. Males accounted for 93.4% of the sample, reflecting that most women declined to take part in the survey, often asserting that they had no interest in e-Government for the reason that official issues were habitually handled on their behalf by male relatives. In terms of employment, 66% were government employees; 11.3% were private agencies employees; 10.4% were students; 8.5% were self-employed; and 3.8% were unemployed.

Table 6.2: Sample demographics

Demographic characteristic	*Category*	*Number of participants*	*Percent*
Gender	Female	7	6.6%
	Male	99	93.4%
Age	15 - 24 years	9	8.5%
	25 - 44 years	86	81.1%
	45 - 64 years	11	10.4%
	65+	0	0%
Place of Living	Tripoli/ near Tripoli	30	28.3%
	Benghazi/ near Benghazi	28	26.4%
	Sabha/ near Sabha	48	45.3%
Education	Primary school	4	3.8%
	Secondary school	8	7.5%
	University (BSc/BA)	70	66.1%
	Master	11	10.3%
	PhD	13	12.3%
Occupation	Student	11	10.4%
	Unemployed	4	3.8%
	Self-employed	9	8.5%
	Employee in private agency/ company	12	11.3%
	Government employee	70	66.0%
Income	Less than 500 LD	10	9.4%
	500 - 1000 LD	35	33.0%
	1000 - 1500 LD	31	29.2%
	More than 1500 LD	30	28.3%

Educationally, 52% had finished their university degree; 28.3% have a master's degree; and 12.3% hold PhDs. Only 3.8% had only finished primary school, and 2.8% stopped studying after secondary school. However, this high level of education was expected, as the questionnaire was distributed at educational institutions. Respondents' incomes showed variety in the level of monthly earnings. To control for bias towards a particular region with respect to respondent demographics, chi-square tests were conducted. All tests were not significant, clarifying no statistical differences among respondent demographics for the three areas. Statistical tests for differences in contacting government agencies or service providers, as well as the interest of electronic games across the three cities, revealed no statistical significance.

6.5.1.2 Computer Knowledge

The survey questionnaire began by querying computer use background. Table 6.3 shows the percentages of computer owners, and whether they owned PCs, laptops and tablets, and/ or smartphones. The latter was included because it could be used for browsing websites (indeed, most internet access in Libya is via smartphones, as explained in the literature review). The results showed that the vast majority of participants owed both a computer (91.5%) and a smartphone (93%).

Table 6.3: Computer owners

		Frequency	***Percent***
Owning PC/laptop/tablet	Yes	97	91.5%
	No	9	8.5%
Owning a smartphone	Yes	99	93.4%
	No	7	6.6%

Figure 6.1 shows computer use among respondents, indicating that over 80% used the computer daily, while a further 10% used it a few times weekly. Very few participants do not use a computer at all. Figure 6.2 shows computer use purposes, which clarifies that 73% use the computer for work or study, while only 26% use their PCs for entertainment purposes.

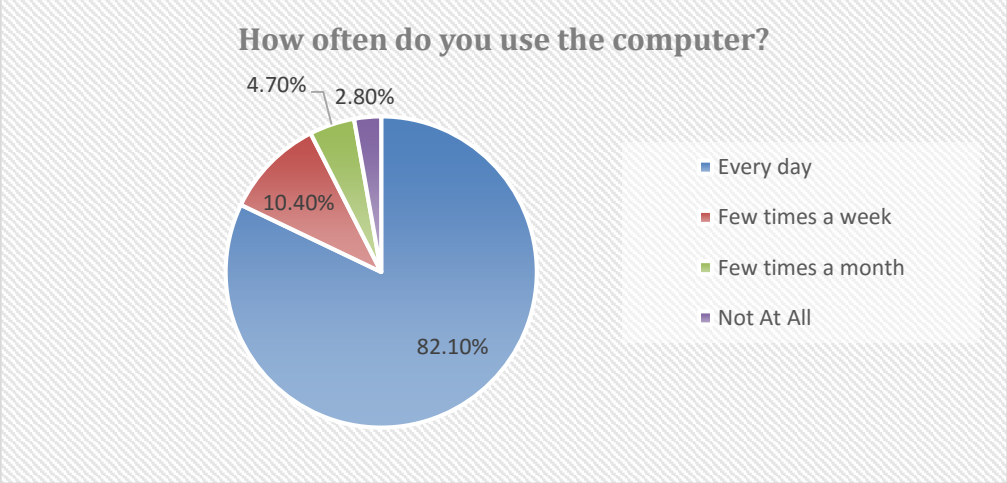

Figure 6.1: Computer use

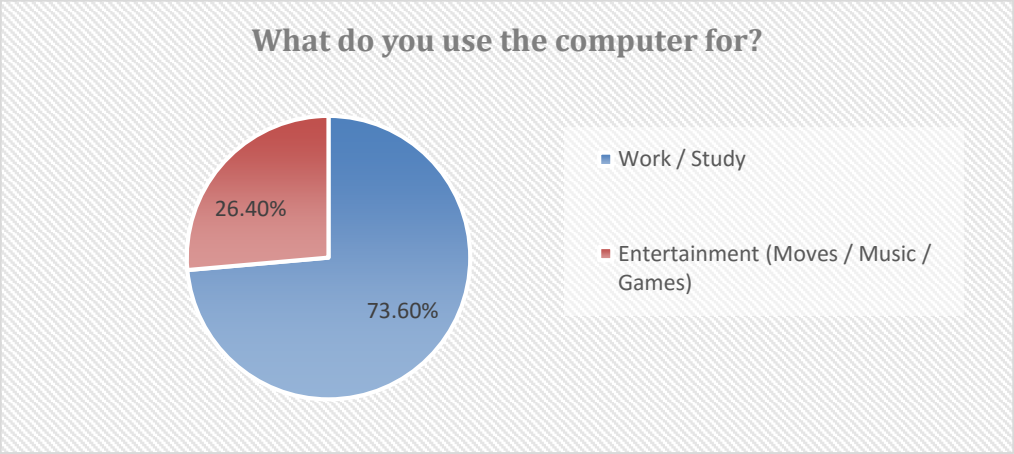

Figure 6.2: Computer use purposes

6.5.1.3 Internet Knowledge

The second section of the questionnaire concerned internet experience. Figure 6.3 shows how often participants access the internet. A high percentage of just over 84% access the internet every day, whereas around 13% go online a few times a week. Very few respondents do not access the internet at all. In addition, nearly 90% of participants use their smartphones to gain access to the internet.

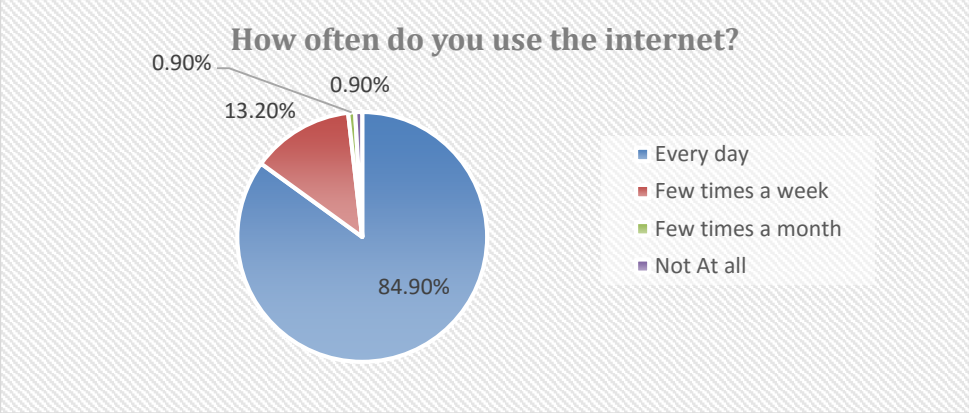

Figure 6.3: Internet use

Similarly, Figure 6.4, illustrates the main reasons for participants' access of the internet. The results indicate that most of the respondents access the internet for entertainment and pleasure purposes, including social media (88%). Only 11% access internet for serious purposes such as work, study or finding information.

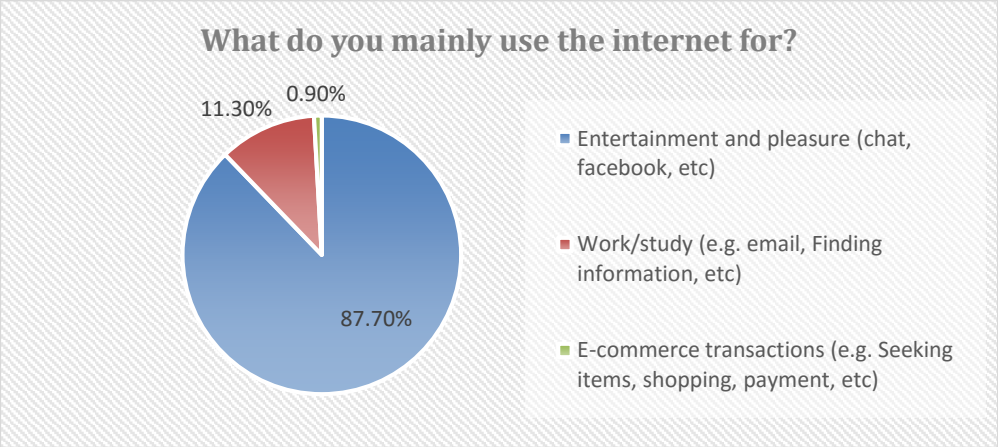

Figure 6.4: Internet use purposes

6.5.1.4 Government Services Experience

This part of the questionnaire started by asking participants to express their contact with the government agencies or governmental service providers. As shown in Figure 6.5, respondents were very different in terms of how frequently they had contact with the government, with 28% of the samples

state that they contact government agencies several times a week, and 30% stating that they only have a few interactions a month, and 29% reported that their governmental communication is once every few months, and around 12% claim that their government contacts are very rare.

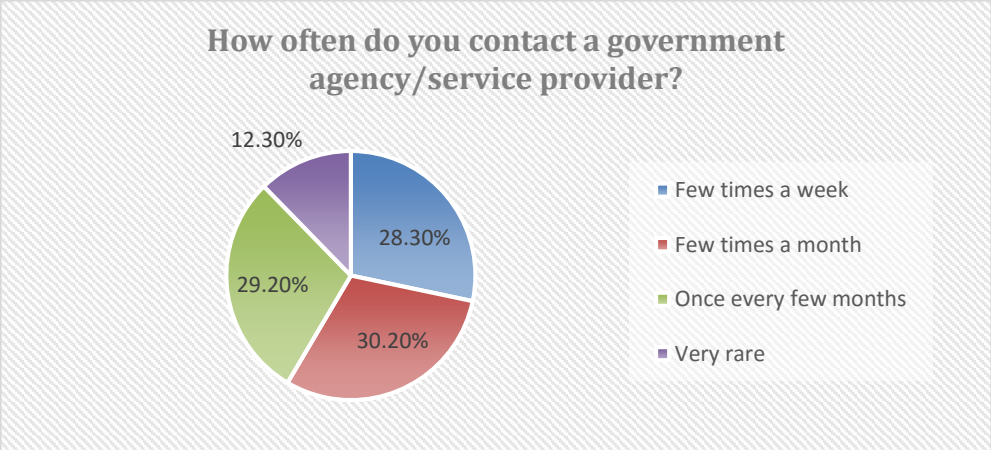

Figure 6.5: Contacting government services providers

After that, participants were asked to clarify how they contact the government. The results shown in Figure 6.6 declare that nearly 70% of samples mainly use face-to-face contact to communicate with the government service providers, while 23% cited using relationships with the staff (*wasta*). Only a few of participants used land lines or mobile phone calls to contact government service providers; similarly, emails or online forms were rarely used, even when available.

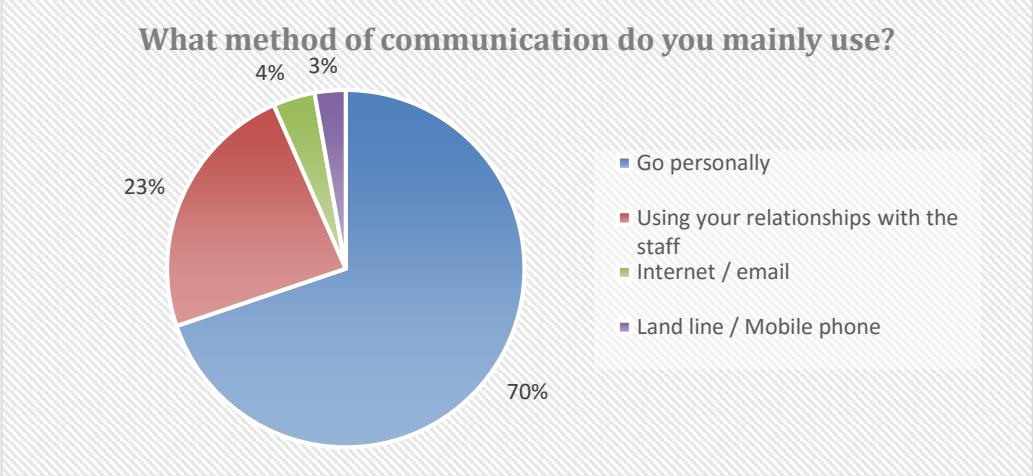

Figure 6.6: Method of communication with government

6.5.1.5 E-Services Experience

Regarding the experience of using e-Services, the questionnaire asked how often participants visit government/ service providers' websites. Figure 6.7 shows the percentages of participants who visit the government online portal weekly, monthly or once every few months (24%, 36% and 36% respectively), and 4% indicated that the never visited any government web page.

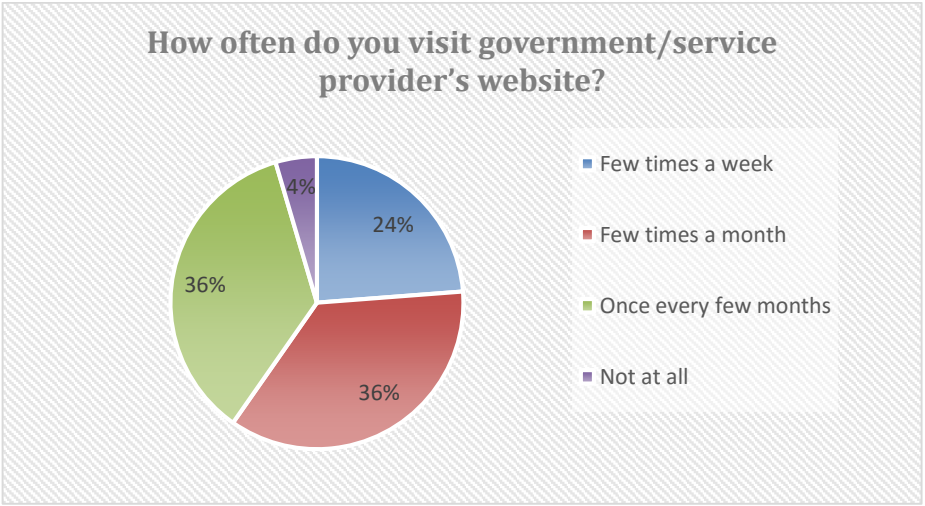

Figure 6.7: Visiting government websites

Subsequently, the survey sought to investigate the purposes of browsing governmental websites. As illustrated in Figure 6.8, the most common reason

was searching for information, as cited by 84% of those who visited. The downloading or filling forms was a second reason to visit, cited by 42%. However, only 9% were using the government online portal as a way of communication.

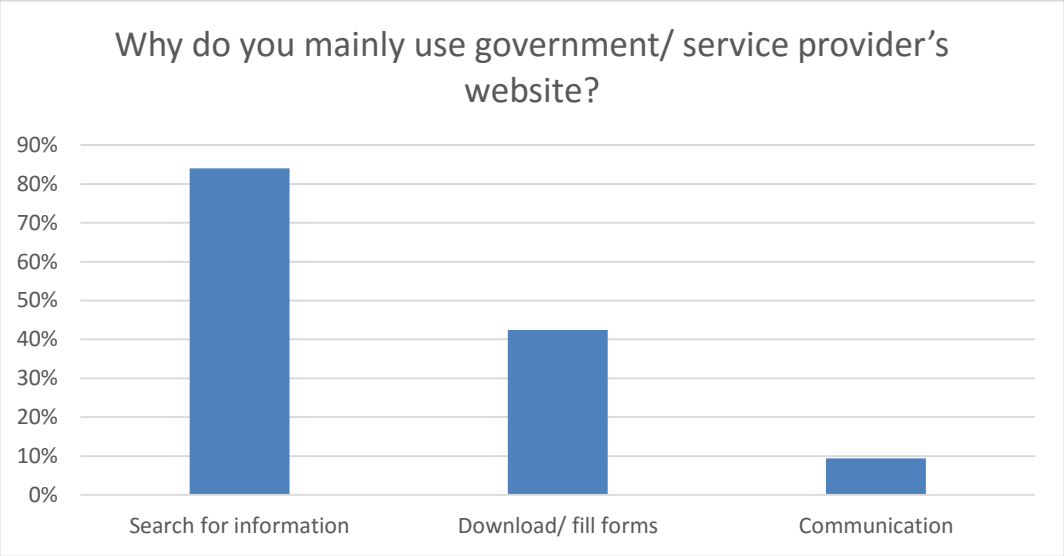

Figure 6.8: Purposes of browsing governmental websites

Use of existing available e-Services to Libyan citizens was also investigated, and the results are presented in Table 6.4. It can be seen that getting a national identification number was the most used e-Service (76%), which was expected as the Libyan government has announced that NIDs must be used in all governmental transactions. Moreover, getting examination results was one of the existing e-Services provided by the Ministry of Education, thus 35% of participants used it to get exam results. Only 20% used e-Services to get passport details required to issue a passport. Almost a third (32%) of respondents reported that they have used other existing e-Services such as downloading and filling forms and searching for information.

Table 6.4: Use of existing e-Services

Use existing e-Services provided by government websites?		*Frequency*	*Percent*
Valid	Getting Exams Result	37	35%
	Getting NID	81	76.4%
	Getting Passport Details	22	20.7%
	Others	34	32%
	Total	101	95.3%
Missing	System	5	4.7%
Total		106	100%

6.5.1.6 Trust in e-Government

This section is one of the key parts of the survey, investigating the level of trust and confidence in e-Services among participants, which was identified as a major concern in previous studies. Likert-scale items were used to measure respondents' satisfaction with given statements. Table 6.4 presents mean and percentage of satisfaction.

Table 6.5: Trust in e-Services

Trust	***Mean***	***Percentage***
I don't trust e-Services in general	2.93	58.6%
I don't trust e-Services if they are not recommended by someone I trust	3.07	61.4%
I don't trust e-Services that I haven't used before	3.03	60.6%
I don't trust e-Services where I don't know who can access my data	3.76	75.2%
I don't trust e-Services if they are not from official government authorities/ providers	4.30	86.0%
I don't trust e-Services if they are not clearly presented and well designed	4.20	84.0%
I don't trust e-Services if they are not always available and reliable	4.30	86.0%
I don't trust the government authorities to keep my online data private and secure	3.74	74.8%

The results reveal that trust has a significant impact on the adoption of e-Services among respondents. Over half of the participants agreed to the statement of not trusting e-Services in general. Moreover, both recommendation and familiarity with e-Services have an effect on trust, as

about 60% of respondents agreed. In addition, 75% cited privacy and security barriers to e-Government use. On the other hand, it is undoubted that availability, reliability and presentation highly affected user adoption of e-Government. Consequently, this finding corroborates the conclusions of many scholars cited in chapter 2, who approved the relationship between availability, reliability and appearance of e-Government and citizen trust and confidence to use.

6.5.1.7 Gaming Experience

Since the proposed framework is presenting the use of serious games as a tool to improve IU, it was very important to investigate participants' gaming activity. This section presents the result of this investigation. First, participants were asked how often they practice electronic games. Figure 6.8 show that 45% of respondents practice electronic gaming on daily or weekly basis. Likewise, over 50% play electronic games on monthly basis. However, only 3% reported no interest in gaming.

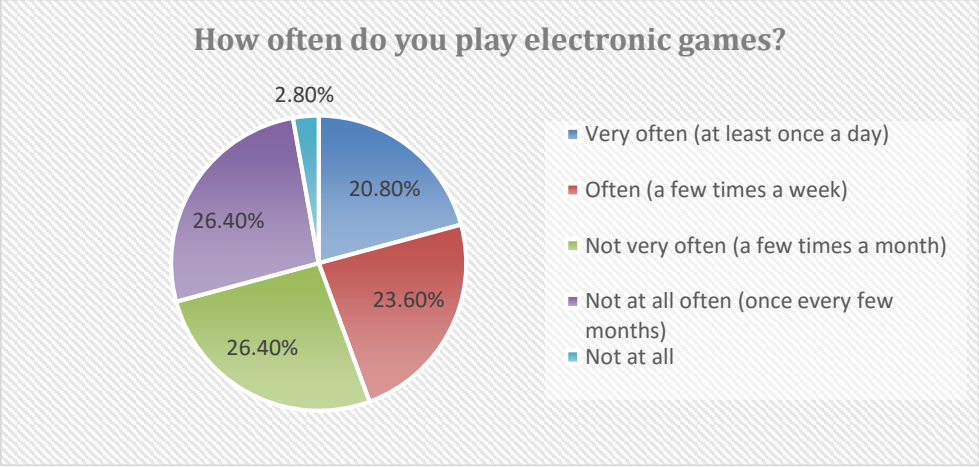

Figure 6.9: Gaming activity

Second, the questionnaire sought to discover what types of games were preferred by participants. It was found that over 90% of respondents played free games, and 75% of the sample showed more interest in individual games while about 15% enjoyed multiplayer games. Social online games have just 10% of participants' interest.

Third, game familiarity was considered by questioning how many times participants practice any game to become familiar with it. Most participants (75%) practice between two and five times to gain familiarity, thus they gain the best score in any game. Additionally, the results reveal that about 45% of respondents use a smartphone to play electronic games.

6.5.1.8 Intention to Play e-Government Serious Games

This part explored whether citizens would use serious games related to e-Services, if available. Over 80% of participants are willing to practice a game that allows them to learn how the government is protecting their data and privacy, and almost 75% of respondents would try a game that allows them to practice and learn how to interact with e-Government services. More discussion on user motivation to play serious games regarding e-Government is presented in chapter 7 (after post-test).

6.5.2 Measures of Validity and Reliability

The measurement model for all four constructs was assessed using CFA as suggested in the literature to test the consistency of constructs measures. All factor loadings exceeded 0.5, which suggests that the measurement model presents a good level of model fit. Also, reliability analysis using Cronbach's alpha was applied, and the results are shown in Table 6.6. The reliability test

results were all above 0.7, the recommended value indicating acceptable reliability and internal consistency of the respective measures. The results of the factor analysis are presented in Table 6.7. Both tests indicate that the measurement model shows adequate convergent validity and reliability.

Table 6.6: Reliability analysis

Construct	***No. of items***	***Alpha***
PEoU	4	.882
PU	3	.778
InT	4	.823
GT	4	.850

Table 6.7: Factor analysis

	Factor loadings			
Item	PEoU	PU	InT	GT
PEoU01	.827			
PEoU02	.791			
PEoU03	.914			
PEoU04	.706			
PU01		.778		
PU02		.897		
PU03		.547		
InT01			.857	
InT02			.928	
InT03			.728	
InT04			.510	
GT01				.616
GT02				.961
GT03				.957
GT04				.521

6.6 Instrument Refinement and Validation

This step was to determine the significance of each hypothesis route in the research mode. Multiple regression analysis was conducted using SPSS to test the research hypotheses, starting with regression assumptions, which revealed no violations of assumptions of multivariate normal distribution,

equality of variance and independence of errors. The results indicate that all factors of the use of serious games (*serious games for learning and expanding knowledge*, and *serious games for practicing and training*) are important factors that influence citizens' intention of using e-Government, while the results also provide evidence of citizens' willingness to use serious games that allow them to practice e-Services.

The significant influence of the serious games for learning and expanding knowledge through playing serious games on ease of use was proven by the path coefficient of 0.642 and t-value of 8.547. The path coefficient and t-value for the influence of practicing and training through playing serious games on ease of use were 0.568 and 7.042, respectively. On the other hand, the influence of learning and expanding knowledge through playing serious games on PU had a path coefficient of 0.697 and the t-value of 9.925. In other words, the influence of the use of serious games based learning and expanding, practicing and training on e-Government use was the strongest among other factors.

In terms of the variance explained, the ultimate endogenous variable, which was willingness to play games related to practice and training for e-Services, had the R2 value of 0.413. This means that the model explained 41.3% of the variance in the ease of use. The willingness of playing games related to learning and expanding knowledge of e-Services had the R2 value of 0.323. Hair et al. (2011) argued that the value of 0.10 is considered moderate and satisfies the minimum threshold. The results of hypotheses testing are presented in Table 6.8.

Table 6.8: Results of hypotheses testing

Variable	*Coefficient*	*t-value*	*Significance*
H1a	.642	8.547	.000
H1b	.568	7.042	.000
H2a	.697	9.925	.000
H2b	.425	4.794	.001
H3a	.406	4.531	.001
H3b	.412	4.614	.001
H4a	.512	6.080	.000
H4b	.487	5.689	.001

The study tests how serious games would increase the level of citizen IU through using serious games for learning, expanding knowledge, practice and training regarding the impact of serious games on PEoU, PU, InT and GT.

Statistical testing on collected data revealed that all hypotheses are supported, as presented in Table 6.8. However, the most significant items indicate that serious games for learning and expanding knowledge have the strongest impact on PU, followed by learning and expanding knowledge and serious game for practice and training affecting ease of use and PEoU. All other hypotheses positively affect citizens' intention to use different degrees.

6.7 Discussion

An important element in adopting e-Government is citizens' trust in the government/state and the internet. Privacy and security mechanisms should be in ensured and clearly presented to citizens in order to enable them to feel confident when using e-Services generally (Bélanger and Carter, 2008). However, in most developing countries, where the public is generally less experienced with IT and online services for non-entertainment purposes. Uncertainty avoidance is high with regard to potential security lapses, either

from hackers or from governments themselves, which results in less readiness for e-Government participation.

As one of the research questions is to discuss how to overcome the barriers of successful adoption of e-Government, it shows that using serious games is of a great value for developing nation governments, particularly in training and expanding knowledge. Serious games can be easily and widely distributed. It is relatively cheap and powerful tools to build confidence and to increase the level of security and privacy mechanisms protecting citizens. Generally that would have wider effects in terms of promoting e-Commerce. Government agencies providing services must promote trust as a significant element in the success of e-Government adoption. Discovering and advertising the benefits of services to citizens through serious games would build trust between users and agencies by experiencing e-Services' reliability, dependability, efficiency and capability. Such publicity would have a positive impact on citizens' understanding of the government agencies' efficiency. On the other hand, PU and PEoU are core elements of (Carter and Bélanger, 2005).

Serious games can deliver the same benefits to e-Government that have been realised in health, training and education by enabling users (both citizens and government employees) to practice interfacing in G2C, G2G, G2B and G2E communication services, allowing them a chance to familiarise themselves with the technology and realise the benefits it offers them.

The literature has stated that government services and website users would mostly recommend the use of e-Government to others after experiencing its applications (Bélanger and Carter, 2008). Thus, the trustworthiness of the

service provider (government agencies) would increase among citizens. Consequentially, the use of serious games would increase users' experience and knowledge, therefore, they would recommend its use to others and thus increase non-adopters' intention to participation.

Governments or service providers should be more focused on user perspectives and its influences on others; according to this dimension, building InT and GT will have positive impacts on user intention. A large number of users are intrinsically sceptical and resistant to adopt e-Government in developing countries for many reasons (e.g. poor internet infrastructure and disillusionment with government generally). However, organised strategies to build confidence, such as serious games, may represent an opportunity for affected e-Government adoption. Therefore, an effort to empower citizens should be made by governments to increase the percentage of governmental e-Services users, which leads to e-Government success.

The proposed framework has made use of most benefits of serious games to provide incentives towards more effective e-Government by encouraging citizens to try online services. Assuming that experiencing online transactions and services within a game would guarantee more time and economic efficiency while improving perceived reliability, trust in government and the internet would be enhanced by such experiences, which in turn increases IU. The findings of this study affirm that users will feel confident adopting e-Government if they try it and know the level of privacy and security. Additionally, citizens are willing to play games which demonstrate how to

interact with e-Government and expand their knowledge regarding its services. Ultimately, combining both entertainment and practicing e-Government will strengthen the impact of the technology on public participation.

6.8 Summary

This chapter described the results of a preliminary investigation of Libyan e-Government. Moreover, the survey results included participants' computer knowledge, internet usage and contact with the government service provider, and presented outcomes of the investigation of public e-Government experience, trust in e-Services and gaming experience. Descriptive analysis of respondents was presented, and statistical analysis and measures of validity, reliability of constructs, and hypotheses testing to validate the proposed framework of use serious games for encouraging citizens' using e-Government services.

Consequently, a serious game prototype was developed to test and evaluate the proposed framework. This game prototype design, development and testing are presenting in the following chapter.

7 Development of a Serious Game Prototype for Use as an e-Government Service

7.1 Introduction

This chapter applies and tests the benefits of using serious games as a tool to encourage citizen participation and to raise the level of public trust in e-Services. In addition, it determines how best to utilise serious game technology to provide significant improvements that translate into better citizen invitations to use e-Government, especially in developing nations. Thus, this task becomes an integral factor in making the knowledge learning an exciting and interactive experience for users. The chapter presents a serious game called *e-Reservation*, which allows citizens to learn how to perform while using the actual service. In addition, it will expand their knowledge of all requirements and information needed to use the service, moreover explaining privacy and security facts as well as advantages of using e-Reservation such as time and cost savings.

The chapter starts by stating the main objectives of the e-Reservation game, then moves to the game design, which discusses how e-Reservation was designed to include all elements of the proposed framework. Moreover, game implementation is discussed, and gameplay. After implementing the e-Reservation game, the testing process was conducted to include both pre-test and post-test evaluation, finishing with data analysis and the results section, which presents the findings and recommendations regarding the use of serious games in e-Government.

7.2 Objectives of the Serious Game Prototype

Passport e-Reservation service was chosen as a prototype for several reasons: the National Identification number (NID) and it is relevant services such as passport reservation are the most advanced e-Government services in Libya, as shown in Table 2.5, and this service is one of them. Moreover, the recent government decision to change to new passports for all citizens has put immense pressure on the Passport and Immigration Departments in Libya. The unstable political situation has made many citizens rush to renew their passports. The advantage of the e-Reservation is that players will practice and learn how to use actual e-Reservation system provided by the government would increase their confidence, as well as knowing the IT technology behind the services in terms of privacy and security to build up trust in using e-Government services.

Therefore, the first objective of the e-Reservation game is to acknowledge to all citizens that their government is offering them services that will save time and cost as well as guarantee some level of transparency by serving them equally. The second objective is to expand public knowledge regarding available services, through explaining all needs and requirement to be able to benefit from the e-Services. Learning how to perform and use the actual service is the main objective of e-Reservation serious game; following the exact same steps and required information will provide personal confidence to use the service. Another objective is to increase the level of trust in technology by explaining the basics security knowledge to the player, and to address the privacy background of the service through informing the user whom is having access to their data. Finally, it seeks to increase the level of

trust in government itself by showing care of serving the public and improve the way they been served in terms efficiency, transparency, privacy and confidentiality. Thus, several elements will be considered when testing the game such as:

- Knowing all requirements to use e-Government services.
- Learn the different steps to use the services successfully.
- Understand the benefits of using it (time/cost saving, efficiency, availability etc.).
- Understand the basic related ICT knowledge.

7.3 E-Reservation Serious Game Design

The E-Reservation serious game was designed based on the proposed framework in Figure 4.5, which applies the benefits of using serious games as a tool to improve citizens' intention of using e-Government. However, for game development, the following model (Figure 7.1), presented by Lotfi et al. (2014), allows the instructors and trainers to design their own serious games makes the acquisition of knowledge and skills more efficient and at the same time entertaining that attracts the learner to play more and more.

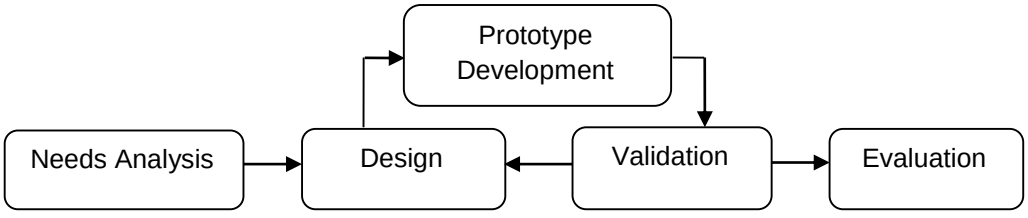

Figure 7.1: Game design model

Source: Lotfi et al. (2014)

7.3.1 Needs Analysis Phase

The needs analysis is the first phase in this design model, during which needs were described by the researcher after information and data was collected through a survey among Libyan citizens to validate a proposed framework (Figure 4.5). Collected data formulated a set of objectives that lead to the creation of e-Reservation. This phase comprises two major steps:

A. *Description of need:* The researcher had to describe the features, general objectives and skills that the user (citizen) must gain during the sequence of e-Reservation serious game.

B. *Formulation of objectives:* The objectives are statements of intent of teaching and training that describe the outcomes of the proposed serious game. They are extracted from the description of need and through different questions considering the conceptual framework. In other words, those objectives describe the aim, skills, and expected results that will be acquired during the use of e-Reservation game.

7.3.2 Design

The design phase is the most delicate phase of the process of serious game building, because in this phase targeted knowledge and skills are combined to create a serious game that respects the different objectives mentioned in the need analysis phase. There are different steps that the game developer must realise during this phase, including developing the game story and make up the flowchart scenario and describing the levels etc.

7.3.2.1 Game Story

Developing the game story was undertaken by describing the successive actions realised by the player to achieve the different objectives related to each mission in the game story. It has to accompany the reality of actions in the actual e-Service, with features of learning and training as play progresses. According to Lotfi et al. (2014), there are some typical questions that will help to develop game story easily despite not having much experience in game story writing:

- Who is the targeted player of the story?
- What are the main objectives of the story?
- What are the obstacles that prevent the player from achieve different objectives and method that can be used to pass them?

Answers should be detailed and well-structured in order to achieve a consistent and entertaining story.

7.3.2.2 Flowchart of Scenario

The flowchart of scenario shown in Figure 7.2 is a graphical representation of the game scenario based on the game story already developed in the above step, which allows having a global and a clear view of the story.

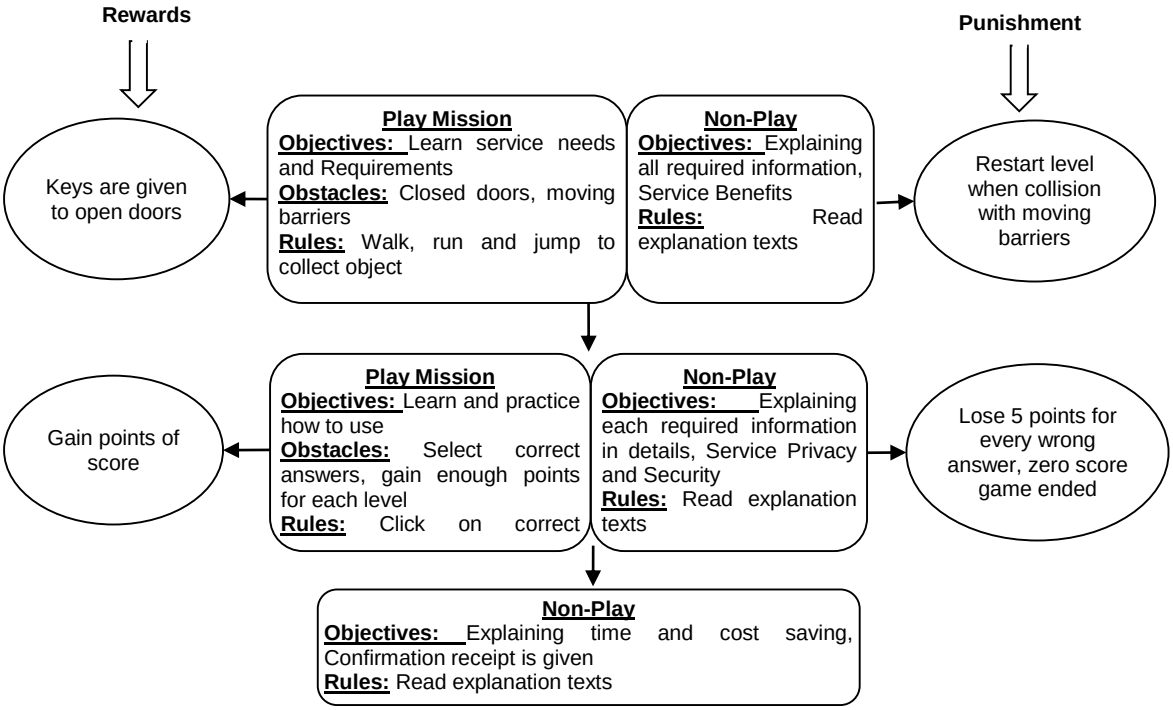

Figure 7.2: e-Reservation flowchart scenario

A. *Non-Play:* This component describes an animation character introducing the mission.

B. *Play Mission:* This the main component, where the player does different tasks and avoids obstacles to achieve the learning and training objective of the mission; this component is composed of three subparts:

   1. Objective: In this part the designer defines the main goal of the mission to be achieved.

   2. Obstacles: In this part the designer describes the different things, objects or events that prevent the player from achieving the main objective of the mission (e.g. time limit, multiple choices, return barriers etc.).

3. Rules: In general, the rule is a relationship between actions (“verbs”) and challenges to indicate how the player should act.

C. *Immersion:* This component is the same as a mission, but with fun objectives; the component is also composed of three subparts (Objectives, Obstacles and Rules), mostly used in the entertainment levels of the game.

D. *Rewards:* Description of recompense given when achieving the objective of the mission or the immersion (e.g. winning the points, opening doors etc.).

E. *Risks:* Description of the penalty that the player will undergo in the event of failing to achieve the objective of the mission or the immersion (e.g. loss of points, start again etc.).

7.3.2.3 Levels Description

In this section of the design process, the different levels of the game were described by developing a map for each level or for each specific area that belongs to the level and gameplay was defined, the dialogue, the technical details specified for each level.

A. *Description of mission:* A simple description of the mission; the description can be realised by detailing some points like the theme, setting and information delivered.

B. *Game mechanics:* The definitions of the game mechanics or the constructs of rules intended use by the player during the mission to achieve the level main goal.

C. *Dialogue:* Presentation of the dialogue that the non-play character will narrate in each level.

7.3.3 Prototype and Development

In order to create a prototype of the serious game, GameMaker Studio was used, since this technology suited the most of the requirements. Moreover, its free version comes with some features that contributing significantly to e-Reservation (Games, 2007).

7.3.4 Validation

In this stage validation of the developed prototype showed what the game will do, and how it will work and look. The advantage of validation is to find the problems or enhancements that they may not be considered before and also verify if the objectives mentioned in the needs analysis phase were respected.

7.3.5 Evaluation

Evaluation is the last phase in the used model, in which the end users (citizens) evaluate and continue the tests begun in the validation phase, and confirming whether the final version of e-Reservation serious game achieved its objectives or not. Broadly speaking, they evaluate against the following question:

- Does this e-Reservation game encourage users to participate?

7.4 E-Reservation Serious Game Implementation

The e-Reservation game is a serious game that aims to empower citizen engagement and participation in e-Government services. It is designed for adult citizens of different age groups and educational levels, as they are all

required to renew their passports. The game stimulates players, since it is full of learning opportunities and acquiring best practices, expanding players' e-Services knowledge. Moreover, players will discover some basic knowledge to increase their IT and trust in e-Services. Also, the e-Reservation game demonstrates the privacy, security and efficiency of e-Services, leading to increased trust between citizens and government.

E-Reservation gameplay is based on rules in questions games type, whereby the player is asked for certain service requirements and information needed. Table 7.1 shows the general overview of the game. Its key features are that it enables the learner to recognise the benefits of e-Government, identify requirements to use e-Government services, learn and practice how to use the e-Services, and identify privacy and security protocols used.

Afterwards, the players can fill a short questionnaire that seeks to investigate user satisfaction and change of IU actual reservation system provided by the government. The game was evaluated against several points, such as delivering the expected objectives, improving citizens' participation and engagement in using e-Government, and assessing users' willingness to use further games related to e-Services.

Table 7.1: General overview of the e-Reservation game

Game Description	*Genre:*	*Serious game learning and training game, rules in questions*
	Game Elements:	Open doors, answering questions, select appropriate answers, gaining points open new levels.
	Game Content:	E-Services knowledge, IT knowledge, practicing e-Reservation system, explain privacy and security
	Theme:	Existing e-Reservation, ICT requirements, system use requirements
	Style:	Real, computer screen view
	Game Sequence:	Linear - storylines, hyper - storylines that the player can influence, simulation
	Player:	One player at a time
Game Reference	Game Taxonomy:	Non-fictional simulation/ game.
	Player Immersion:	Mental, strategy, narrative
	Reference:	The actual passport e-Reservation services in Libya
Game Technical	Technical From:	2D graphics (flat)
	Platform:	GameMaker
	Device:	PC, tablets
Game Sales	Consumer Group:	e-Government service users (citizens)/ participants

7.4.1 E-Reservation Game Structure

7.4.1.1 Control

The player experiences the e-Reservation game as a real world e-Services user, through renewing passport reservation prototype. The game is organised in levels to correspond to the different stages/roles in the renewal of passport reservation system. The player progresses in the game by accumulating experience and points in return for accomplishing simple tasks. Levels involve answering questions, filling forms and selecting appropriate choices. The player must at all times ensure that all required information is submitted correctly.

7.4.1.2 Reward Points

Reward points can be gained and lost throughout the gameplay. Reward points indicate how good the player is at answering questions and selecting options while filling forms. The player must maintain enough points at all

times. Points will be lost by submitting wrong answers and staying a long time on the same level.

7.4.1.3 Task Points

Players earn points for accomplishing each stage and to move forward to the next stage of the game. Although these points are not displayed during the game, they are used to measure when the player has completed the current level. A summary of the points won and lost during each level will be displayed at the end of the game. These points will also contribute to the total points score displayed throughout the game.

7.4.2 E-Reservation Gameplay

The proposed serious game is based on the actual reservation system that is available for citizens to use in order to be booked for renewal/issuance of passports in Libya. Thus, the e-Reservation game is following all its steps, needs and requirements. Moreover, the game has an entertainment value, starting by the sampling system requirements, such as national ID, computer and internet connection for a playing character to collect in order to be given a key to use the service. Among the knowledge that the proposed game must provide to the learners is system requirements. Next, another entertainment level explains all information the citizen needs to enter into the system, including family file number, national ID, valid contact number (mobile), selecting a city and the agency location that the citizen wishes to be served at. This level has simple challenges of character jump to reach the target objects and has to avoid moving barriers. These entertainments and challenges were included in the game to increase player willingness to

continue the rest of the levels. Figure 7.3 shows screenshots of the main menu and level two of e-Reservation.

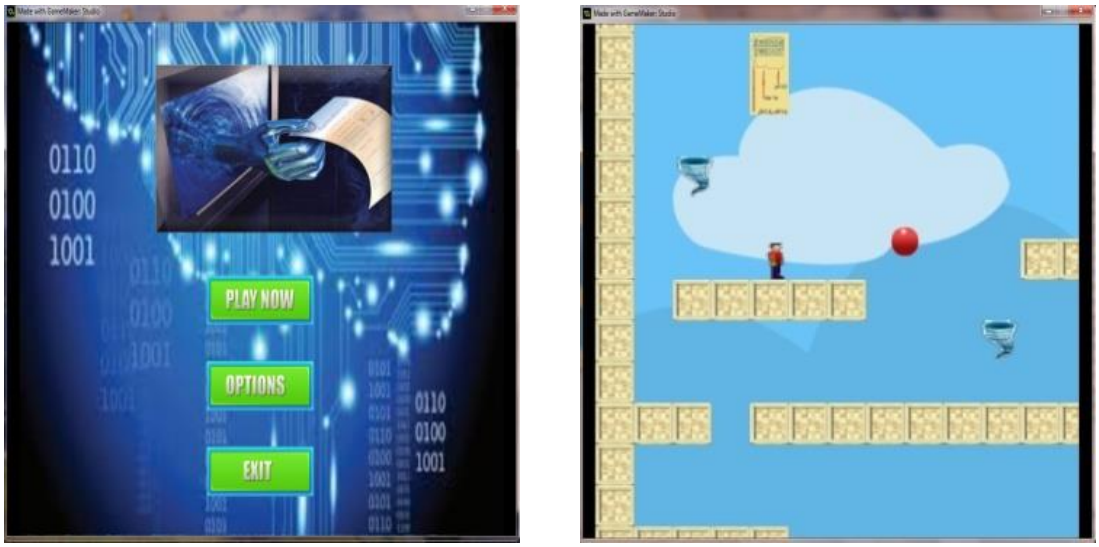

Figure 7.3: Main menu and level two of e-Reservation serious game

After finishing the second level, the player should know all needed information in detail, and then simulation of the actual system can be introduced in the next level by asking a simple question of “Do you have a national ID?” This clarifies the importance of holding a valid ID in order to use the system. The following level involves filling in information, where the user is given three options for every section, only one of which is in a correct format. Points are awarded for clicking on the correct selection, and deducted for the wrong choice. In addition, the non-play character explains all privacy and security protocols used to protect citizen data and information, as shown in Figure 7.4.

After finishing the information-filling level, the players click next to open the family member list level. In this stage, as in the real system, the player has to select one or more family members who wish to renew/ issue a passport from the list. More explanation of privacy and security is provided at this level. The

following level includes a calendar with days in different colours as they appear in the actual system, with the non-play character telling and explaining the difference between them and how it saves time and cost to be booked. After selecting a valid date the user has to confirm and print a confirmation receipt provided. Additional screenshots are presented in appendix (C).

Figure 7.4: Screenshot of actual reservation system, filling information and IT knowledge levels of e-Reservation serious game

7.5 E-Reservation Game Testing

A questionnaire was developed to discover how the participants rated the Usefulness (UF), Ease of Use (EoU), Internet trust (InT), and Government trust (GT), relating to e-Reservation game, as well as, willingness to use the actual reservation system in the future.

The samples are the actual e-Services user (Libyan citizens) intending to either renew or issue new passports at Passport and Immigration Departments in Libya. Selection of these participants guaranteed that all participants were genuine Libyan citizens targeted by the actual e-Reservation service. Second, this sample would allow the researcher to gain

both pre-test and post-test evaluation due to practical considerations. Finally, this ensuring sufficient reliable respondents for the questionnaire.

7.5.1 Pre-Tests Evaluation

In order to evaluate the effectiveness of the use of a serious game to encourage citizens to use e-Government services, both pre- and post-tests were required. As the e-Reservation system is an existing service provided by the government to the public in Libya, the pre-test has focused on the participant involvement and experience. The proposed framework main categories were utilised to develop the knowledge questions used in the pre-test. These categories included knowing, familiarity, using and whether an appointment was booked on the day or not. First, “knowing” questions investigate whether participants knew about the service and their benefits. Second, familiarity questions examined users’ familiarity with the data and information needed to use the services, as well as privacy and security concerns. The third category investigated whether the participants had used e-Reservation services before, while the final one indicated whether the participants had successfully booked an appointment to be served with their passport issuance or renewal.

7.5.2 Post-Test Evaluation

The proposed framework main elements were also utilised to develop the satisfaction questions used in the post-test to match the knowledge questions in the pre-tests. The five-point Likert-type scale was used to measure the participants’ satisfaction in terms of understanding the nature of the service, the needs and requirements of use, how to use the service and privacy and

security issues. In addition, participants' confidence to use the actual system was investigated.

Post-tests evaluated the e-Reservation game prototype by exploring user control of the game, learning elements of the game, intention to use serious games related to e-Government in future, and recommending e-Reservation game to others to use. An open ended question was asked to investigate how this game prototype could be improved.

7.5.3 Control group

A new modified interactive simulation of the e-Reservation game excluding entertainment elements was used for control group experiment. However, all proposed framework main elements were also included within the simulation. Also, post-test questionnaire of five-point Likert-type scale was used to measure the participants' satisfaction in terms of: understanding the nature of the service; the needs and requirements of use; how to use the service; and privacy and security items. In addition, participants' confidence to use the actual system was investigated. A repeated measure design was selected to measure the impact of not including the entertainment in the control group. It allows the researcher to focus on one variable (Age) among both experiments and control group.

7.6 Data Analysis and Results

This section contains the overall data analysis results of the use of the proposed e-Reservation serious game prototype by the sampled Libyan citizens. The game was used by 85 people, 91% of whom were males. All respondents were coming to issue/renew their passports in different

occasions during five days of fieldwork. The questionnaire conducted included 19 citizens aged 15-24 years, 29 aged 25-44, 21 aged 45-64, and 16 over 65 years old. Their occupations were categorised as students (19%), government employees (34%), employees of private businesses (16%), self-employed (8%), unemployed (12%) and retirees (11%). Nearly half of the participants had completed a university degree, 28% had finished secondary education, 14% have reached postgraduate level and the rest had basic education (e.g. high school).

Table 7.2 shows a summary of pre-test evaluation. Moreover, the statistics shown in Figure 7.5 indicate that at baseline, 28% did not know what e-Reservation services are, only 32% knew all the requirements and 71% had not used it themselves before. In terms of having booked appointments, 57% of participants had been booked for the day they came in. However, 75% of them asked a friend or relative who has good ICT knowledge and experience to book their appointment. The five-point Likert-type scale was used to measure the participants' satisfaction in terms of understanding the nature of the service, the needs and requirements of use, how to use the service and understand privacy and security issues, whose results are shown in Table 7.3.

Table 7.2: Game evaluation pre-Test

Theme	*Frequency*	*Percentages*
Know what e-Reservation services are	61	71.7%
Familiarity (required data/information)	27	31.7%
Use of the service	25	29.4%
Booked for appointment	48	56.4%

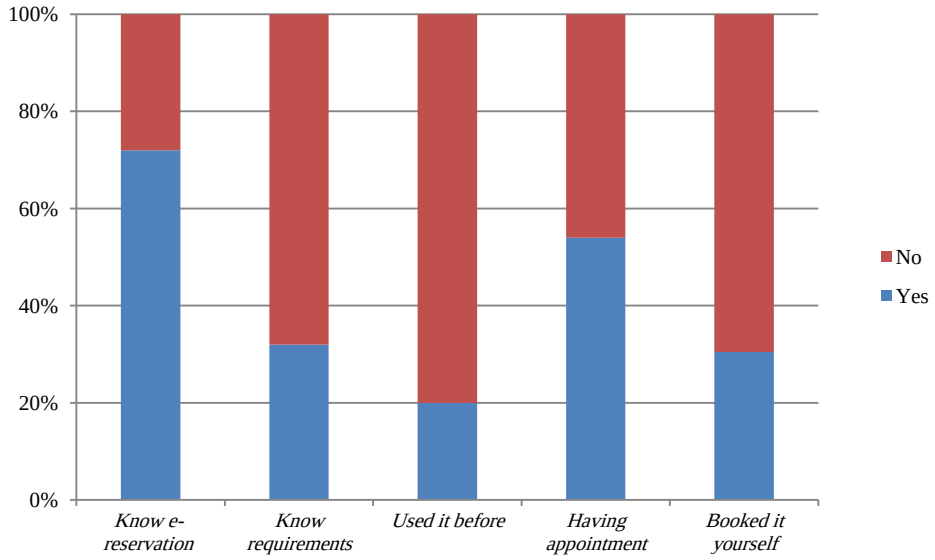

Figure 7.5: e-Reservation service experience

Table 7.3: Game evaluation post-test

Theme	*Average*	*Percentages*
Satisfaction	3.9	78%
Willing to use actual services	4.12	82%
Recommend the game	4.4	88%

After using the game, 78% of respondents expressed satisfaction and willingness to use the actual e-Reservation service provided by government (measured in terms of confidence, ease of use and usefulness) was expressed by 82% of citizens. Finally, the vast majority (88%) said they would recommend the e-Reservation game to others.

The control group with a total of 19 participants compared with experimental group with a total of 33. Both groups were matched based on age to determine the impact of entertainment elements on participants of age group 15 – 44. The conducted experimental included 10 citizens aged 15-24 years, 9 aged 25-44 randomly selected Libyan citizens in the UK. 16 male and 3 girls, their occupations were categorised as students (53%), government employees (47%). Nearly two third of the participants was doing or just completed a university degree, 34% currently doing postgraduate study. 72% of participants heard about passport e-Reservation service. However, just 42% know the requirement to use the service besides only 31% have used it before. Although, 83% of participant who have already used the service have booked appointment for friend or relative who has no or little IT knowledge and experience.

Compare means and ANOVA test were conducted to obtain participant satisfactory and willingness to use the actual e-Reservation service. In general, there were no significant difference between experiment group and control group as presented in table 7.4. For instance, “After playing the game, I feel more confident that, I can use actual e-Reservation service” (Mean experimental = 4.18, SD = 0.769; Mean control = 4.68, SD = 0.713).

Table 7.4: Means comparative analysis between groups (with Entertainment and without Entertainment)

Control Group		I would recommend friends to play this serious games to know how to use e-Reservation services	After playing the game, I feel more confident that, I can use actual e-Reservation service	The e-Reservation game helped me to understand the nature of the service	The e-Reservation game helped me to understand the needs and requirements to use the service	The e-Reservation game helped me to understand how to use the service	The e-Reservation game helped me to understand how easy and quick to use the service	After playing the e-Reservation game, I feel that I learned and gained new skills	After playing this e-Reservation game , it will be easier for me to use the service in the future	Learning to operate this e-Reservation game was easy
with Entertainment	Mean	4.58	4.18	4.03	4.06	4.15	4.06	3.94	4.24	4.06
	N	33	33	33	33	33	33	33	33	33
	Std. Deviation	.663	.769	.728	.704	.755	.747	.827	.751	.704
without Entertainment	Mean	4.68	4.21	4.21	4.37	4.26	4.11	4.00	4.47	4.26
	N	19	19	19	19	19	19	19	19	19
	Std. Deviation	.478	.713	.631	.597	.653	.567	.816	.513	.653
Total	Mean	4.62	4.19	4.10	4.17	4.19	4.08	3.96	4.33	4.13
	N	52	52	52	52	52	52	52	52	52
	Std. Deviation	.599	.742	.693	.678	.715	.682	.816	.678	.687

A one-way ANOVA using control group as the dependent indicated that the difference in confident levels to use actual e-Reservation was not significant ($p = .895$, $p < 0.05$) as presented in table 7.5, however there was no significant difference due to entertainment.

Table 7.5: ANOVA test (with Entertainment and without Entertainment)

			Sum of Squares	Mean Square	F	Sig.
I would be willing to play serious games related to other e-services * Control Group	Between Groups	Combined	2.138	2.138	3.733	.059
	Within Groups		28.632	.573		
	Total		30.769			
I would recommend friends to play this serious games to know how to use e-Reservation services * Control Group	Between Groups	Combined	.142	.142	.390	.535
	Within Groups		18.166	.363		
	Total		18.308			
After playing the game, I feel more confident that, I can use actual e-Reservation service * Control Group	Between Groups	Combined	.010	.010	.018	.895
	Within Groups		28.067	.561		
	Total		28.077			
The e-Reservation game helped me to understand the nature of the service * Control Group	Between Groups	Combined	.392	.392	.812	.372
	Within Groups		24.128	.483		
	Total		24.519			
The e-Reservation game helped me to understand the needs and requirements to use the service * Control Group	Between Groups	Combined	1.142	1.142	2.562	.116
	Within Groups		22.300	.446		
	Total		23.442			
The e-Reservation game helped me to understand how to use the service * Control Group	Between Groups	Combined	.150	.150	.290	.593
	Within Groups		25.927	.519		
	Total		26.077			
The e-Reservation game helped me to understand how easy and quick to use the service * Control Group	Between Groups	Combined	.024	.024	.051	.823
	Within Groups		23.668	.473		
	Total		23.692			
After playing the e-Reservation game, I feel that I learned and gained new skills * Control Group	Between Groups	Combined	.044	.044	.065	.799
	Within Groups		33.879	.678		
	Total		33.923			
Learning to operate this e-Reservation game was easy * Control Group	Between Groups	Combined	.495	.495	1.050	.311
	Within Groups		23.563	.471		
	Total		24.058			

To conclude, comparing pre-test and post-test collected data indicates that e-Reservation game has improved users' confidence and intention to use the actual service. Within e-government real application, serious game with little or no entertainment feature can be utilised as effective and motivational tools, regardless of citizens' age. This finding gives account to the research question regarding the extent of the effectiveness of using serious games to develop citizens' adoption of e-Government. Therefore, the use of serious games has a good impact on citizens' participation in e-Government.

7.7 Discussion

This chapter examined how serious games would provide an opportunity to improve public engagement in e-Government to reduce the probability of failure by focusing on e-Government clients' participation. It also discussed the use of serious games as a tool to increase citizens' intention to get government information and to conduct governmental online transactions. The results show that 57% of respondents booked an appointment, but just 25% of them did so individually (unaided). Thus, there is an undeniable problem among citizens attempting to use the governmentally provided e-Service. On the other hand, after testing, the given serious game level of confidence had risen and 82% of participants were willing to use it. This significant change in users' intention was made after learning, practicing and expanding knowledge about the e-Services. Therefore, this contributes addressing the third research question about the effectiveness of using serious games to develop citizens' adoption of e-Government. It shows that serious games could provide a great opportunity for e-Government in developing nations if used to empower the public. Nevertheless, some respondents suggested improving the proposed game, notably in terms of being based on a mobile platform, for easy distribution and accessibility. Others argue that entertainment should not be included in learning and practicing the game, especially elderly participants. For that, a modified interactive simulation of the e-Reservation was used for the control group to compare the impact of entertainment feature within the e-Reservation game. The findings showed no major difference between e-Reservation game including entertainment and simulation e-Reservation. Young and old participants' satisfaction through the use of the game did not

differ significantly, and the simulation was found to be equally motivational for all age group.

A large number of users are doubtful and disinclined to adopt e-Government in developing countries for many reasons, including the digital divide, less internet experience and disillusionment with government generally. However, organised tools to build confidence, such as serious games with no or little entertainment, would represent an opportunity for affected e-Government adoption. Therefore, governments should make an effort to encourage the public in order to increase the percentage of governmental e-Services users, which leads to e-Government success. This work has proposed and tested a serious game prototype to motivate users to participate in e-Government.

The game was given to Libyan e-Government clients and post-test evaluation data was collected. The proposed serious game is dedicated to following the sequence steps of the actual reservation system with detail explanation of each stage to gain familiarity and confidence, additionally providing players with all rules and system requirements. The evaluation indicated that significant improvement could be delivered to the field of e-Government adoption if serious games are used as tools to fill in the digital divide and increase public awareness.

7.8 Summary

E-Reservation serious game is increasing citizen engagement in e-Government services by explaining the process and values of existing reservation system, starting by advertising the service and its benefits to citizens through providing full knowledge, followed by learning how to perform

with the services, then practicing by following the same steps, which increases confidence and changes beliefs and behaviours. Therefore, the level of trust in government and online services is achieved through understanding explained rules of privacy and security. Finally, all of these processes would lead to instilling motivation, increasing public awareness and motivating citizens to take action.

The following chapter is the detailed discussion of the results presented in this chapter and previous chapters, addressing the research hypotheses for the critical benefits of using the serious game to improve e-Government effectiveness.

8 Conclusion and Recommendation

8.1 Introduction

This chapter presents the conclusions of the main research findings derived from the previous discussions. It starts by providing an overview of the aim and significance of the research. Followed by an overview of research process and methodology. Then, a discussion of the research outcomes is presented. Later, the original contributions to knowledge are highlighted and practical and academic implications are discussed. Finally, it presents recommendation for future research.

8.2 Aim and significance of the research

This research discussed the major problem of lack of citizen engagement and participation in e-Government, particularly in developing countries, compounded by lack of knowledge, experience, trust in e-Services and government itself.

Hence, this study is of major importance to developing nations as it seeks to focus on the e-Government systems as socio-technical systems. It is important to accommodate the needs of end users, i.e. the public; e-Government requires a high level of public participation. The main aim of this research is to propose a conceptual framework that promotes effective e-Government using serious games to promote citizen engagement.

The objectives of this research were to fill the gap in knowledge on the determinants of success/failure of the implementation of e-Government services and applications, especially in developing countries particularly

Libya. The second objective is to develop a conceptual framework that would aid governments and organisations that attempt to implement e-Services through understanding all factors that may affect users' Intention to Use e-Services and determine the adoption needs. In other words, this study investigated how serious games could provide an opportunity to raise public engagement in e-Government to reduce the probability of failure by focusing on e-Government users' engagement and participation, and the use of serious games as a tool to increase citizens' intention to get government information and to conduct online governmental transactions. This study applied an integrated approach utilising the TAM and TM theoretical models in a focused framework of intention to use, based on which a serious game prototype was developed and tested.

Mainly, the research seeks an answer of the research question of "how to develop framework that can be used as conceptual guidance in increasing citizen' participation with e-government in developing countries?". To answer this question, the research addressed the issues of: factors that influence the citizens' acceptance and adoption of e-government services in Libya, how to overcome the barriers of successful adoption of e-Government in Libya, and determine to what extent the use of serious games can be effective in developing citizens' adoption of e-Government.

8.3 Research Process and Methodology

This research applied a post-positivism paradigm, adopting the mixed research methodology. Since this study explores the difficulties of the successful implementation of e-Government in developing countries, the

qualitative methodology was applied first to investigate the state of Libyan e-Government project and barriers facing its implementation through the use semi-structured interviews. Quantitative method was used as it is the most appropriate. Since this research explores a new framework increasing citizen' participation with e-government in its real context, there is an urgent need for more research attempts, especially in the context of this research to determine to what extent the use of serious games can be effective in developing citizens' adoption of e-Government, which allows generalising the results and therefore used in the same context or in other contexts with similar circumstances. As one of the advantages of quantitative research method is contribute to greater confidence in the generalisability of results.

It used the design of exploratory sequential case study with the quantitative method as the major approach. As a developing country, Libya was chosen as a case study for this research due to the paucity of information concerning the country's e-Government strategy, and its particular governance-related conditions.

The study started with a comprehensive review was conducted of the literature of e-Government in developed and developing nations, as well as factors in e-Government success. A preliminary qualitative research investigating the stage of e-Government in Libya and discovering the issue Libyan e-Government project is facing was conducted through purposive interviews with experts at senior levels of eLibya. And the results were used to formalise the research problem and direction. Moreover, a review of serious

games literature was carried out to explore its advantages and how it could be used to address the shortages of e-Government adoption.

The second research stage was for framework building and validation. A survey questionnaire was distributed across different Libyan population in three cities to validate the proposed framework and anticipate further potential barriers of implementing e-Government. As the researcher refined and proposed the model and developed a comprehensive research framework.

The last stage was the development of a serious game artefact. E-Reservation serious game was developed based on the proposed framework as a tool to improve citizens' intention of using e-Government. A questionnaire was used to discover the participants' satisfaction and to express their willingness to use the actual services after trying it in a game. An experimental control group was conducted to examine the impact of entertainment aspects within the game.

8.4 Research Outcomes

8.4.1 Factors influencing citizens acceptance and adopting e-Government

This study has focused on the most important factors that have an influence on citizens' intention to use in a Libyan context.

8.4.1.1 Ease of Use

The result indicates that Libyan citizens' self-confidence regarding using e-Services is low. Since high percentage of participants go to government offices personally or use their personal relations with employees as their main

method of communication with government due to the low level of familiarity with e-Services. Therefore, the e-Reservation game has followed the exact steps and format of the real services to gain familiarity which has encouraged the participants to practice the system in repetitive tool which has increased their confidence, willingness and ability to use the service in real context. The findings revealed that familiarity with e-Government transactions with in serious game improved PEoU and thus affected greater intention to use in the Libyan context.

8.4.1.2 Usefulness

The result of this research showed that lack of knowledge and experience among Libyans is one of the main challenges facing the adoption of e-Government in Libya. This includes the understanding of benefits of online transactions in terms of cost and time saving, availability, reliability, equality and reduced administrative corruption (and increased transparency in the governance context).

This research proposes using serious games to expand knowledge and discover benefits would increase user adoption. The findings showed the use of serious games as learning and expanding knowledge tools has a strong positive impact on user understanding of its benefits and individuals' intention to use.

8.4.1.3 Internet Trust

In the context of Libya, the research findings indicate low level of internet trusts among the participants in the performance of online governmental transaction although they access the internet for entertainment and social

communication. As reason the e-Reservation game included a brief description of security protocols and access privacy to users' data that has encouraged the participants to know more about the system in safe context which has increased their willingness and ability to use the service in real context. Moreover, the experience of participants of saving costs and time has raised their satisfactory level and confidence towards the use of e-Reservation system as an example of e-Government services.

8.4.1.4 Government Trust

Correspondingly, The finding of this study, revealed a low level of trust among Libyan citizens in their government and one-to-one is the most preferable participants' method of governmental interaction to ensure completion of services. Also, it indicated that citizens' data in accordance with privacy and secure conditions was one of the reasons causing low trust whereas it stated that participants do not trust the government authorities to undertake such protection. This research explored the building of trust in government through the use of serious games in the e-Government services context. For that, the e-Reservation serious games included some hints of government care to serve the public equally, providing an opportunity to build some trust between citizens and government authorities, in addition to explain how e-Government services improve transparency and reduce the level of corruption as well as keeping users well-informed and updated about services provided by the government has higher level of satisfaction and willingness to use actual e-Government, which is a respectable indication of the advantages that the use of serious game could bring in this context.

8.4.2 Overcoming the barriers of successful adoption of e-Government

As one of the research questions is to discuss how to overcome the barriers of successful adoption of e-Government, the study shows that using serious games is of a great value for developing nation governments, particularly in training and expanding knowledge. Serious games can be easily and widely distributed in the context of study. It is relatively cheap and powerful tools to build confidence and to increase the level of security and privacy mechanisms protecting citizens. Generally that would have wider effects in terms of promoting e-Commerce. Government agencies providing services must promote trust as a significant element in the success of e-Government adoption. Discovering and advertising the benefits of services to citizens through serious games would build trust between users and agencies by experiencing e-Services' reliability, dependability, efficiency and capability. Such publicity would have a positive impact on citizens' understanding of the government agencies' efficiency. On the other hand, PU and PEoU are core elements of (Carter and Bélanger, 2005).

Serious games can deliver the same benefits to e-Government that have been realised in health, training and education by enabling users (both citizens and government employees) to practice interfacing in G2C, G2G, G2B and G2E communication services, allowing them a chance to familiarise themselves with the technology and realise the benefits it offers them.

8.4.3 Use of serious games for effective e-Government

Answering the research question about the extent of the effectiveness of using serious games to develop citizens' adoption of e-Government. This

research shows that serious games could provide a great opportunity for e-Government in developing nations if used to empower the public. Nevertheless, some criteria and suggestions should be followed to effectively use serious games to improve uses' participation in the context of Libya.

It indicates that the game should focus on learning and expanding knowledge, practicing and training. In addition, it reveals that mobile platform for games are preferable for the easy of distribution and accessibility. However, entertainment elements in the serious games for the purpose of increasing public participation are doubtful. It reveals that for e-Government real application entertainment elements are not preferable by elderly participants. Alongside the findings indicate that entertainment within the game has no significant impact on participants younger participants. Overall, organised tools to build confidence and trust, such as serious games, would represent an opportunity for affected e-Government adoption.

8.5 Contribution to Knowledge

8.5.1 Theoretical Contributions

This study introduced a major contribution to the theoretical account of citizens' participation and e-Government adoption. As mentioned before, most of the existing literature on e-Government implementation had a techno-centric focus. Thus, this research goes beyond the previous research by describing the influence of users' intentions to participate in e-Government more comprehensively, as well as how to use serious games to influence the motivation, confidence and trust. That would in turn have impacts upon the actual use of e-Services. In this perspective, four papers have been already

published based on different parts of this research. Besides, one journal article still under reviewing in the Journal of Strategic Information Systems.

The finding contributes to an advanced improvement of e-Government implementation in developing countries by focusing on citizens' encouragement. Overall, this research makes three main contributions to theory:

Firstly, the current research extends the TAM and TM models to include serious games as support for their external variables that affect users' actual use. The proposed framework uses serious games based learning and expanding knowledge as well as serious games based practicing and training to achieve more intention of use. This framework can be validated and tested in different contexts of developing nations to establish the boundaries of its applicability.

Secondly, the results provide explanations on how factors of PEoU, PU, InT and GT affect success implementation of e-Government. The results highlight the positive relationship between all these factors and the effectiveness of e-Government.

Lastly, the thesis provides significant original contributions to knowledge by presenting serious games to the context of e-Government. In terms of principles, it supports the adoption of e-Government and improve citizen' intention to engage and participate. More specifically, this thesis provides insights into the nature of citizen motivation to the actual use of e-Services, both for government and citizens, and provides evidence that there is a link

between the uses of serious games advantages to achieving more effective e-Government.

8.5.2 Practical Contributions

The results of this research have important practical contributions, particularly in relation to improving e-Government use or e-Government readiness in Libya. This research provides a more comprehensive understanding of the challenges that eLibya is facing.

The results showed that a lack of awareness and self-confidence to use e-Services are the main barriers preventing citizens from participating in electronic transactions. Therefore, the government should focus more on increased public awareness and trust. In addition, the findings indicate that there is a lack of trust in the Libyan government itself, which exacerbates unwillingness to participate, therefore the government authorities must do more to explain the potential benefits of e-Government in terms of improving accessibility and accountability, and enabling more efficient government service delivery, along with explaining how it will protect user data. In addition, the study has made a new contribution to the research and has expanded the boundaries of knowledge about Libyan e-Government aims, opportunities and challenges.

The findings indicate that serious games are an effective tool to close the familiarity gap for Libyan citizens. An interesting side note that emerged was that smartphones would be the best platform to promote the effectiveness of games due to ease of use and distribution among citizens. This offers insights into the application of serious games, providing a new rationale for their use in

learning and training in Libya, and an understanding of the characteristics that facilitate motivation and engagement, as well as providing evidence of the effectiveness of game use.

8.6 Research Implications

This study extends the serious games literature into the e-Government context. The results indicate that the use of serious games would have the same benefits of education and training if used in e-Government services. In terms of e-Government success being directly affected by citizens' participation, the findings reveal that citizens are willing to play games that allow them to learn about and practice e-Services, thus improving citizens' intention to use actual e-Government services.

E-Services literature has clearly stated that when customers have the option of using e-Services, trust is one of the main factors in their attitude and perception of actually utilising them. Therefore, the implication for research is that serious games technology broadens our understanding toward online trust in the e-Government context by hypothesising the different effects of trust in state and in the internet.

Similarly, the results show high willingness among citizens to use serious games that would expand their knowledge and understanding of the level of privacy and security and how their data are protected, in addition to how e-Government contributes to increasing transparency and government service quality. It is necessary to understand that investment in building citizen trust is important for the utilisation of all e-Services, however how serious games

must be designed and developed to address trust, which still requires further research.

8.7 Limitations of Research

This research developed a framework for improving citizens' participation for effective e-Government through using serious games based learning and training. The proposed framework draws upon two well-known models, TAM and TM. It has been validated using survey data collected from citizens in Libya, then tested by developing a serious game prototype of e-Government service. However, this study has some limitations that should be acknowledged.

The first limitation is regarding the survey participants, who were selected randomly in three educational institutions, where community events were taking place. Due to the location of random selection, most of the respondents were highly educated. In addition, due to cultural reasons, many females declined to participate in the survey. Thus, the findings of the survey based study may not be fully representative of the whole community.

The second limitation of the research is regarding the prototype development. The shortage of funding during the later stage of the study prevented the researcher from integrating the prototype mobile phone platform that would allow more participants to be included in the game testing stage.

The third limitation is regarding the post-conflict situation in Libya and the extraordinary political difficulties within the country during the period of fieldwork, which resulted in the game only being tested in the city of Sabha.

This was due to personal safety considerations, whereby the researcher was not able to arrange serious game prototype testing in the other two cities where the survey took place. Nevertheless, the demographic statistical analysis shows no significant difference among the three regions for which the research aimed to generalise.

The last limitation of this study can serve as an opportunity for future research: the proposed framework was validated and tested in the context of Libya only. Even though the literature shows that similar studies that validate different models of e-Government adoption or acceptance were conducted in the context of only one specific country, the serious games advantage was not applied to the context of e-Government before, and it is important to validate this framework in other developing countries and employ diverse samples. The findings could then be compared to achieve greater generalisability.

8.8 Future Research

For future work, it is believed that the proposed solution of using serious games must be expanded and tested in different developing countries. In addition, further work is needed in the implementation and design of serious games to make the most of the gaming advantages as a tool to assist citizens' participation in e-Government by upgrading public understanding of the benefits and use of such technology. In addition, research should be conducted to identify how games can be generalised to facilitate wider citizen participation and engagement in e-Government, including the use of mobile phone games.

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Appendix A: Interview Guideline

Interview Guideline

The main aim of this interview is to explore and investigate empirically how an e-government project is adopting in Libya. Evaluating the stage of development of e-government and exploring the main technological and organisational issues that affect the development. The interview also examines the level of public participation, and based on the collected data the initial research problem will be clarified. This leads to the following Questions:

I. Evaluation Current State

1. What is the main target of e-government in Libya?
2. Which stage of implementation has the project reached?
3. How would you evaluate the implementation process?
4. What will be the future direction of the e-government project in Libya?

II. Management

1. What are the management challenges the project facing?
2. How the government is addressing the management issues?
3. How would you suggest sorting management issues?

III. Technical

1. What kind of technical issue Libya e-government has?
2. How the government is addressing the technical issues?
3. How would you suggest sorting issues?

IV. Cultural

1. How do you rate the citizens' use of available e-government services?
2. Are you satisfied with the public participation so far?
3. Have the government reached the target number of e-government users?
4. If not? What do you think is preventing citizens from participation?

V. Other issues

1. Would you like to add any other issue regarding e-government in Libya?

Appendix B: Survey Questionnaire

Serious Games for e-Government

Introduction

Dear respondent,

Thank you for agreeing to take part in this study. The purpose of this study is to explore factors that may potentially influence citizen's trust of e-government services in Libya as well as to investigate the extent to which the use of serious games in e-government services would provide opportunities to empower citizen engagement and participation. Also investigate whether technology-knowledge has an effect on citizen engagement in government initiatives. E-government is defined as invitation from the government to all of its agencies, citizens, and businesses to communicate electronically. This questionnaire is part of a PhD study at the University of Wolverhampton.

We very much appreciate your very generous contribution. Please note that all responses are anonymous and will be kept confidential and at no time will be ask for or record your personal details. Please fill in the questionnaire along with any additional comments you feel would be helpful. If you would like further clarification please do not hesitate to contact me through the following email address a.ahmed21@wlv.ac.uk

The questionnaire will take approximately 10 to 15 minutes to complete. Your help is very much appreciated. Please complete all the questions in this questionnaire; otherwise we will be unable to use your very valuable contribution.

Yours sincerely,

Alsanossi Ahmed

Serious Games for e-Government

Computer Knowledge

1. Which of the following electronic devices do you own? (Please select all that apply.)

- [ ] Desktop Computer
- [ ] Laptop Computer
- [ ] Tablet computer (e.g. iPad, Samsung Galaxy)
- [ ] All
- [ ] I don't own any of these electronic devices

2. How often you use computer?

- ◯ Very Often (at least once a day)
- ◯ Often (a few times a week)
- ◯ Not Very Often (a few times a month)
- ◯ Not At All Often (once every few Months)
- ◯ Not At All

3. What you use Computer for?

- [ ] Work / Study
- [ ] Entertainment (Moves / Music / Games)
- [ ] Other (please specify)

4. Do you own a smartphone?

- ◯ Yes
- ◯ No

5. what you use smartphone for?

- [ ] Just Making Calls
- [ ] Browsing
- [ ] Gaming
- [ ] All above
- [ ] Other (please specify)

Serious Games for e-Government

Internet Knowledge

6. How often do you use the Internet?

- ◯ Very often (at least once a day)
- ◯ Often (a few times a week)
- ◯ Not very often (a few times a month)
- ◯ Not at all often (once every few months)
- ◯ Never

7. Where do you mainly use the Internet?

- ☐ Home
- ☐ Work
- ☐ Internet café
- ☐ Other (please specify)

8. How much do you spend per month on the Internet in LD?

- ◯ Above 50 LD
- ◯ between 25 - 50 LD
- ◯ between 5 - 25 LD
- ◯ Free Access

9. what you use the internet for? Please rate your answers. 1 mostly, 2 regular, 3 rare.

	Entertainment and pleasure (e.g. email, chat, facebook, etc)
	Work/study
	E-commerce transactions (e.g. shopping, payment, etc)

Serious Games for e-Government

Government Services Experience

10. How often do you contact a government agency/service provider?

- ◯ Very often (at least once a day)
- ◯ Often (a few times a week)
- ◯ Not very often (a few times a month)
- ◯ Not at all often (once every few Months)
- ◯ Never

11. What method of communication do you mainly use?

- ◯ Face to face
- ◯ Agents
- ◯ Landline/Mobile phone
- ◯ Internet/email
- ◯ Other (please specify)

12. Which method of communication do you prefer?
which method you think it would save your time and does the work if you have chance to use it

- ☐ Face to face
- ☐ Agents
- ☐ Landline/Mobile phone
- ☐ Internet/email
- ☐ Other (please specify)

Serious Games for e-Government

e-Government Experience

e-Government Services such as:
1. Informing the citizen - making information widely available to citizens with the aim of increased transparency and accountability, providing information about the political process, about services and choices available. (e.g. latest government decisions, latest jobs availability, etc.)

2. Improved service delivery - by giving the citizens a greater choice, faster delivery and improved efficiency of services. (e.g. election registration, appointments booking, downloading forms, etc.)

3. Increasing citizen participation - improving accessibility of citizens to their elected members, creating a vision for partnership in the decision making process. (e.g. communicate with government authorities or officers, etc.)

13. How often do you use government/service providers websites?

- ◯ Very often (at least once a day)
- ◯ Often (a few times a week)
- ◯ Not very often (a few times a month)
- ◯ Not at all often (once every few Months)
- ◯ Never

14. Why do you mainly use government/service providers websites?

- ☐ Search for information
- ☐ Download forms
- ☐ Communication
- ☐ Payment
- ☐ Other (please specify)

15. How often do you use the existing e-government services?

	Very Often (a few times a week)	Often (once a week)	Not Very Often (a few times a month)	Not At All Often (once every few Months)	Not At All
Searching Information	◯	◯	◯	◯	◯
Getting Exams Result	◯	◯	◯	◯	◯
Getting NID	◯	◯	◯	◯	◯
Getting Passport Details	◯	◯	◯	◯	◯
Election Registration	◯	◯	◯	◯	◯
Other e-Services	◯	◯	◯	◯	◯

Serious Games for e-Government

Trust in e-government

16. Please read the following statements carefully and answer them according to the extent with which you agree or disagree with them.

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
I don't trust e-services in general	◯	◯	◯	◯	◯
I don't trust e-services if they are not recommended by someone I trust	◯	◯	◯	◯	◯
I don't trust e-services that I haven't used before	◯	◯	◯	◯	◯
I don't trust e-services where I don't know who can access my data	◯	◯	◯	◯	◯
I don't trust e-services if they are not from official government authorities provider	◯	◯	◯	◯	◯
I don't trust e-services if they are not clearly presented and well designed	◯	◯	◯	◯	◯
I don't trust e-services if they are not always available and reliable	◯	◯	◯	◯	◯
I don't trust the government authorities to keep my online data secure	◯	◯	◯	◯	◯
I don't trust the government authorities to keep my online data private	◯	◯	◯	◯	◯

Serious Games for e-Government

Game Experience

17. How often do you play electronic games?

- ◯ Extremely often (More than once a day)
- ◯ Very often (at least once a day)
- ◯ Often (a few times a week)
- ◯ Slightly often (a few times a month)
- ◯ Not at all often (once every few Months)
- ◯ Never

18. what do you use to play electronic games?

- ☐ Computer
- ☐ Tablet
- ☐ Smartphone
- ☐ PlayStation
- ☐ Other (please specify)

19. What type of games do you play?

- ◯ Free
- ◯ Paid
- ◯ Both

20. How many times you play game until you become familiar with?

- ◯ One time
- ◯ two - five times
- ◯ More than five times

21. what game do you prefer more?

- ☐ Individual
- ☐ Multiplayer
- ☐ Social game

22. Which games do you like more?

- ◯ New games
- ◯ Familiar games

23. On which games do you normally get best results?

- ◯ New games
- ◯ Familiar games

24. Please read the following statements carefully and answer them according to the extent with which you agree or disagree with them

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
I learn new skills by playing electronic games	◯	◯	◯	◯	◯
I feel more confident to play the game in real life if I played it electronically	◯	◯	◯	◯	◯
I think using e-services will be more clear and understandable if I practice it in a game	◯	◯	◯	◯	◯
I think practicing how to interact with e-services by playing training games would enhance my confident to use it	◯	◯	◯	◯	◯
I think playing serious games related to e-services would enable me to interact with the service more quickly	◯	◯	◯	◯	◯
I would play games that allow me to learn how to interact with e-government services	◯	◯	◯	◯	◯
I think playing learning games would provide a valuable knowledge for me	◯	◯	◯	◯	◯
It would be encouraging for me to use e-government services if I Know its usefulness through trying it in a game	◯	◯	◯	◯	◯
It would be encouraging for me to use e-government services if I Know how its save me time and cost	◯	◯	◯	◯	◯
It would encourage me to use e-government services if I know how the government is protecting my online data	◯	◯	◯	◯	◯
I would feel more confident in using e-government services over the internet if I know its level of security to protect my data	◯	◯	◯	◯	◯
I would feel more confident in using e-government services over the internet if I know its level of data privacy	◯	◯	◯	◯	◯
I would trust online services if I have been trained by practice them through a game	◯	◯	◯	◯	◯
I would feel more confident in using e-government services if I know who will have access to my data	◯	◯	◯	◯	◯
I would trust the government if they keep me well informed about e-government services and how to interact with it	◯	◯	◯	◯	◯
I would trust the government if they show how e-government services improve the transparency and reduce level of corruption	◯	◯	◯	◯	◯
I would play games that allow me to learn how the government is protecting my data and privacy	◯	◯	◯	◯	◯

Serious Games for e-Government

Demographics

25. What is your gender?

- ◯ Female
- ◯ Male

26. What is your age?

- ◯ 15 - 24
- ◯ 25 - 44
- ◯ 45 - 64
- ◯ older 65

27. Where do you live?

- ◯ Tripoli / Near Tripoli
- ◯ Benghazi / Near Benghazi
- ◯ Sebha / Near Sebha
- ◯ Other (please specify)

28. What is the highest level of education you have completed?

29. Which of the following best describes your current occupation?

- ◯ Student
- ◯ Government Employee
- ◯ Employee in Private Agency/Company
- ◯ Self Employee
- ◯ Unemployed
- ◯ Other (please specify)

30. What is your approximate average household income?

- ◯ Less than 500 LD
- ◯ 500 -1000 LD
- ◯ 1000 - 1500 LD
- ◯ More than 1500 LD

Appendix C: e-Reservation Game

E-Reservation Game

This was the serious game developed as part of this research. The aim of *e-Reservation Game* was to build citizens, confident and trust as well as expand their knowledge regarding e-reservation service to encourage them to use it. However, these screen shots are in English language whereas the Arabic version of the game was used in the process of testing and data collection to meet the participant language.

Figure C-1. The Introduction page

The PLAY NOW button is to enter the game, ABOUT button is to display the game discerption page, and EXIT button is to end the game.

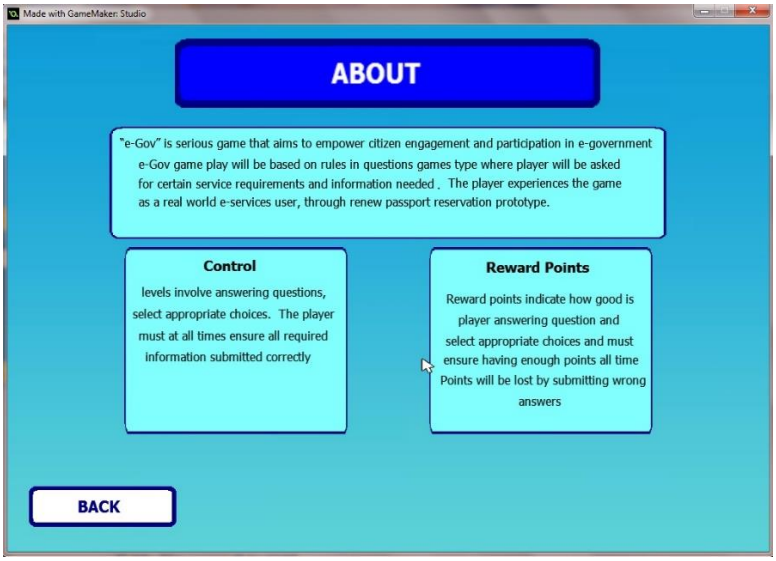

Figure C-2. The About page

In this page figure C-2 user can read about the game purpose, control and reward points.

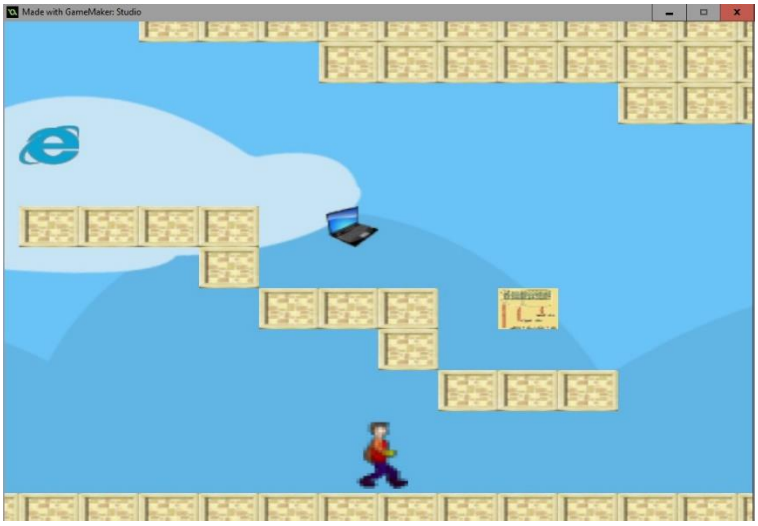

Figure C-3-1. Entertainment requirement page 1

Figure C-3-2. Entertainment requirement page 2

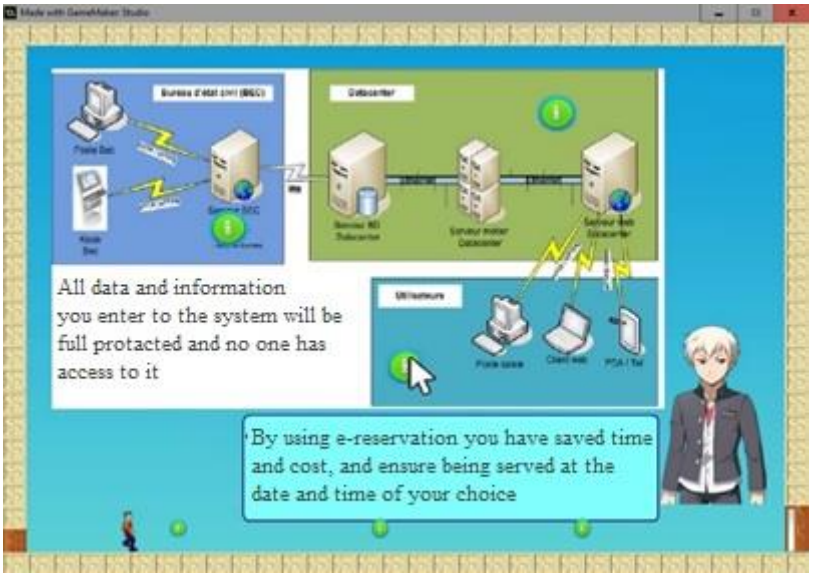

Figure C-3-3. Entertainment privacy and security page 1

Figure C-4-1. Entertainment steps of e-reservation service page 1

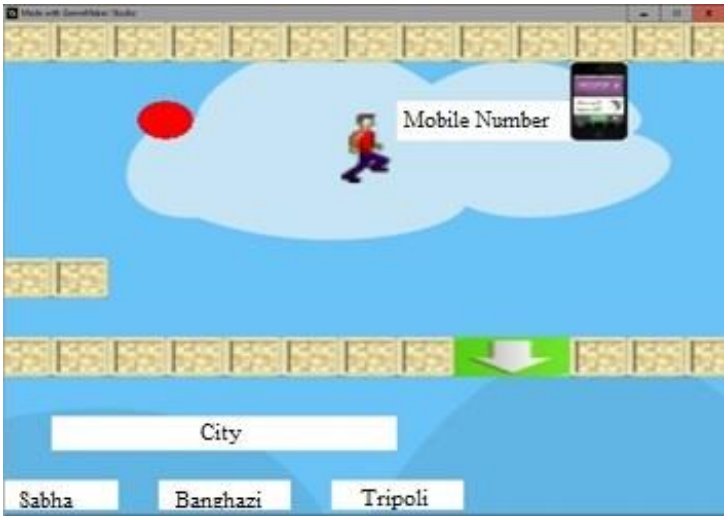

Figure C-4-2. Entertainment steps of e-reservation service page 2

Figure C-4-3. Entertainment steps of e-reservation service page 3

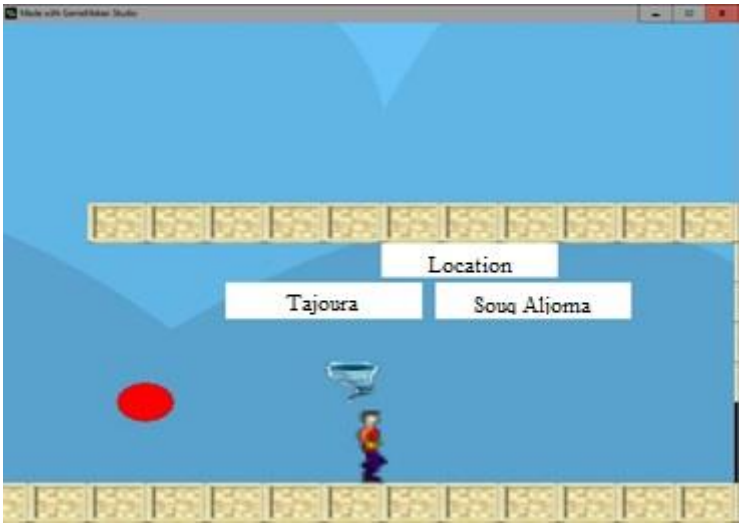

Figure C-4-4. Entertainment steps of e-reservation service page 4

Figure C-4-5. End of entertainment page

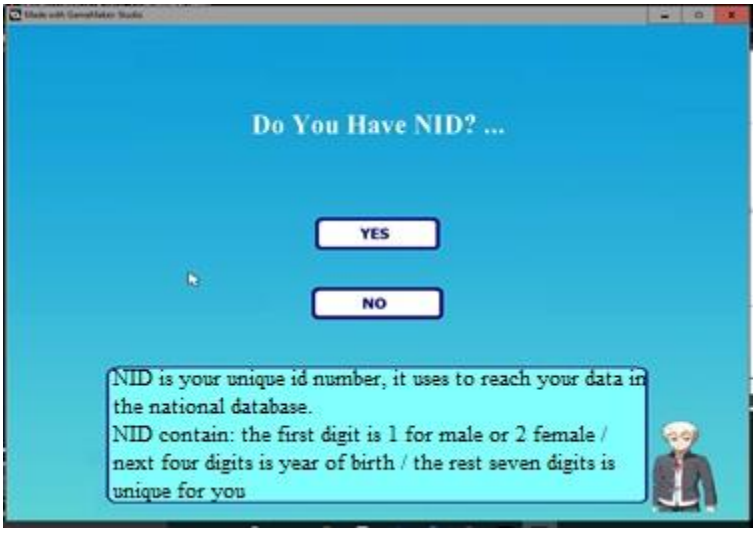

Figure C-5-1. Start of e-Reservation first steps page 1

The first task is to learn ensure the user hold NID to be able to use passport e-reservation service. The user needs to use the mouse and answer the question “Do you have NID?” by clicking on “Yes” or ”No” option. If “No” was selected the game will directed to No NID holder page. In this page user will be informed that he/she has to have NID to be able to use the service. However, user still has the option to play the game and learn how the service works. Non-Play character is explaining the NID to the user.

Figure C-5-2. E-Reservation service first step page

Selecting “Yes” will lead the user to the filling Page. In this page the game is following the same steps of actual service filling information stage. Whereas, user has to fill certain required information including File number, NID, Mobile Number, Select City, select location, and fill the security pass as shown. In addition, this page is including score points and time counting. Non-play character is explaining all required information in details to help user understand what these information are and where user could find them.

After all required information is selected correctly the game will move to the family member selection page as shown in next figure.

Figure C-5-3. E-Reservation service second step page

When one or more family members are selected the use will be able to move to the next page where he/she can select an appointment.

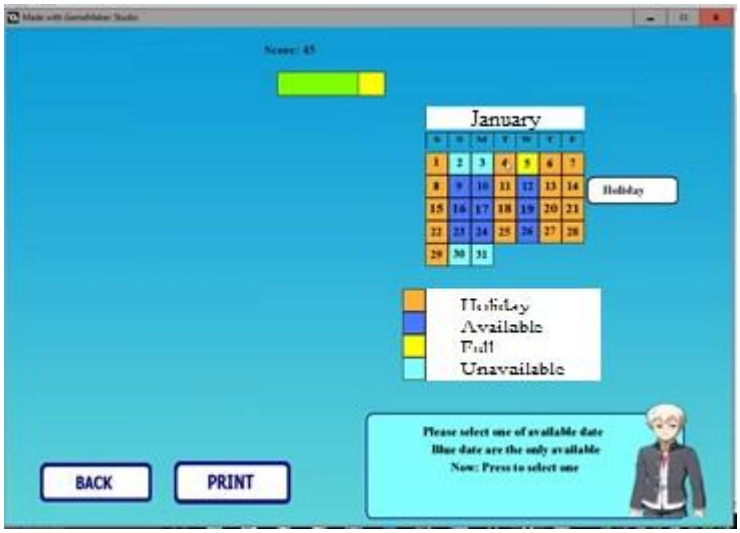

Figure C-5-4. E-Reservation service third step page

After selecting available date a printing option will be available to user to print an appointment confirmation.

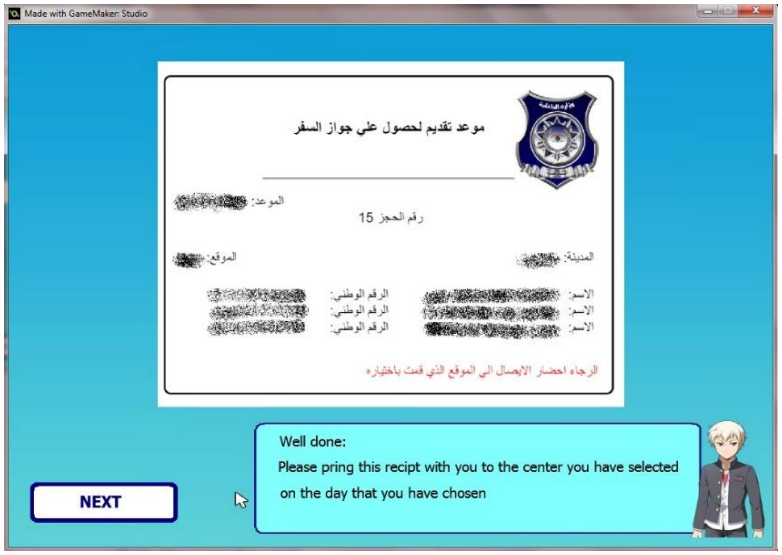

Figure C-5-5. E-Reservation service forth step page

Lastly, congratulation page be introducing to the user including time of the process the user took to finish booking an appointment.

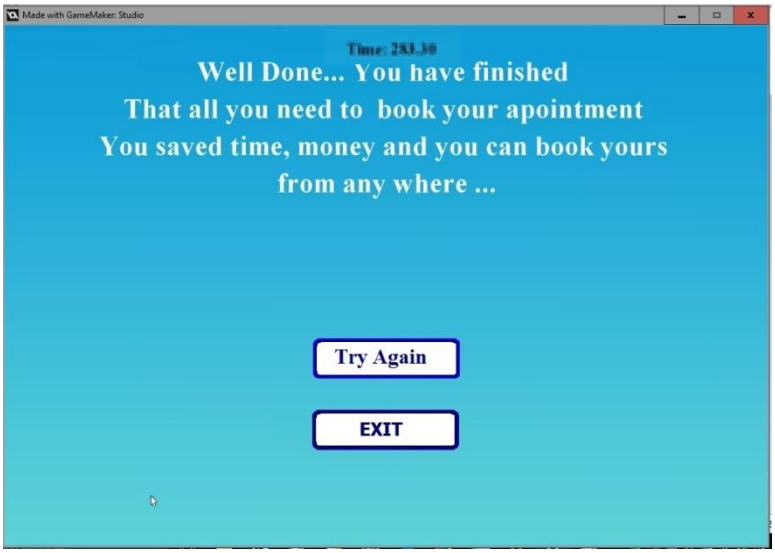

Figure C-5-6. E-Reservation service last step page

Appendix D: Post-Test Questionnaire

e-Reservation

Game Evaluation Post-Test

Introduction

Dear respondent,

Thank you for agreeing to take part in this study. The purpose of this study is to explore your satisfaction about learning and training through playing e-Reservation serious game. Moreover, it is to investigate the extent to which playing this game would provide opportunities to empower your intention to use the actual Passport e-Reservation System. This questionnaire is a part of a PhD study at the University of Wolverhampton.

We appreciate your very generous contribution. Please note that all responses are anonymous and will be kept confidential and at no time you will be asked or we record your personal details. Please fill in the questionnaire along with any additional comments you feel might be helpful. If you would like further clarification, please do not hesitate to contact me on the following email address a.ahmed21@wlv.ac.uk

The questionnaire will take approximately 5 to 10 minutes to complete. Your help is highly appreciated. Please complete all the questions in this questionnaire; otherwise we will be unable to use your very valuable contribution.

Yours sincerely,

Alsanossi Ahmed

e-Reservation

Game Evaluation Post-Test

Demographics

Personal Information

1. What is your gender?

- ◯ Female
- ◯ Male

2. What is your age group?

- ◯ 15 - 24
- ◯ 25 - 44
- ◯ 45 - 64
- ◯ 65 and older

3. Which of the following best describes your current occupation?

- ◯ Student
- ◯ Government Employee
- ◯ Employee in Private Body
- ◯ Self Employed
- ◯ Unemployed
- ◯ Other (please specify)

4. What is your level of education?

- ◯ Postgraduate level
- ◯ University level
- ◯ Secondary / Vocational Education level
- ◯ Basic Education level
- ◯ Did not attend school education

e-Reservation

Game Evaluation Post-Test

e-Reservation service experience

5. Do you know what is e-reservation service?

- ◯ Yes
- ◯ No

6. Do you know all requirements to be able to use e-reservation service?

- ◯ Yes
- ◯ No
- ◯ Some of them

7. Have you ever used any e-reservation service before?

- ◯ Yes
- ◯ No

8. Have you got appointment today?

- ◯ Yes
- ◯ No

9. If yes, how did you get your appointment?

- ◯ Yourself
- ◯ Friend or relative who has good IT knowledge and experience
- ◯ Other

e-Reservation

Game Evaluation Post-Test

Game Experience

Please give only ONE answer for each question by circling the number 1 to 5 below.

10. Please read the following statements carefully and answer them according to the extent with which you agree or disagree with them

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
The e-Reservation game helped me to know the nature of the service	○	○	○	○	○
The e-Reservation game helped me to understand the needs and requirements to use the service.	○	○	○	○	○
The e-Reservation game helped me to understand how to use the service.	○	○	○	○	○
The e-Reservation game helped me to understand how easy and quick to use the service.	○	○	○	○	○
I had a full control of the e-Reservation game whilst playing.	○	○	○	○	○
After playing the game, I feel more confidant that, I can use actual e-Reservation service .	○	○	○	○	○
After playing the e-Reservation game, I feel that I learned and gained new skills.	○	○	○	○	○
After playing this e-Reservation game , it will be easier for me to use the service in the future.	○	○	○	○	○
Learning to operate this e-Reservation game was easy.	○	○	○	○	○

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
If a further serious game would be given to me, I would be willing to use it as well	◯	◯	◯	◯	◯
I would be willing to play serious games related to other e-services	◯	◯	◯	◯	◯
I would recommend friends to play this serious games to know how to use e-Reservation services.	◯	◯	◯	◯	◯

11. How do you think this game could be improved?

Appendix E: Consent Letter

UNIVERSITY OF WOLVERHAMPTON
KNOWLEDGE • INNOVATION • ENTERPRISE

Faculty of Science and Engineering

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Title of study: conceptual framework to improve citizens' intention of using e-government

Research Leader: Alsanossi Ahmed, PhD student, School of Computer Science, Faculty of Science and Engineering, University of Wolverhampton, UK
Tel: 00447438106571
Email: a.ahmed21@wlv.ac.uk or alsanossi_a@yahoo.com

Supervision team: Dr. Kevan Buckley
E-mail: K.A.Buckley@wlv.ac.uk
Prof. Robert Moreton
E-mail: R.Moreton@wlv.ac.uk

To whom it may concern,

I am carrying out a study for developing a conceptual framework to improve citizens' intention of using e-government. For the purpose of data collection, this study is to explore citizens' satisfaction about learning and training through playing e-Reservation serious game. Moreover, it is to investigate the extent to which playing this game would provide opportunities to empower their intention to use the actual Passport e-Reservation System. I will be grateful if you could grant me and my team permission to distribute e-Reservation game and questionnaire to citizens who are coming to issue/renew passport in your agency.

Regards

A. Ahmed

Alsanossi Ahmed
PhD Student
University of Wolverhampton

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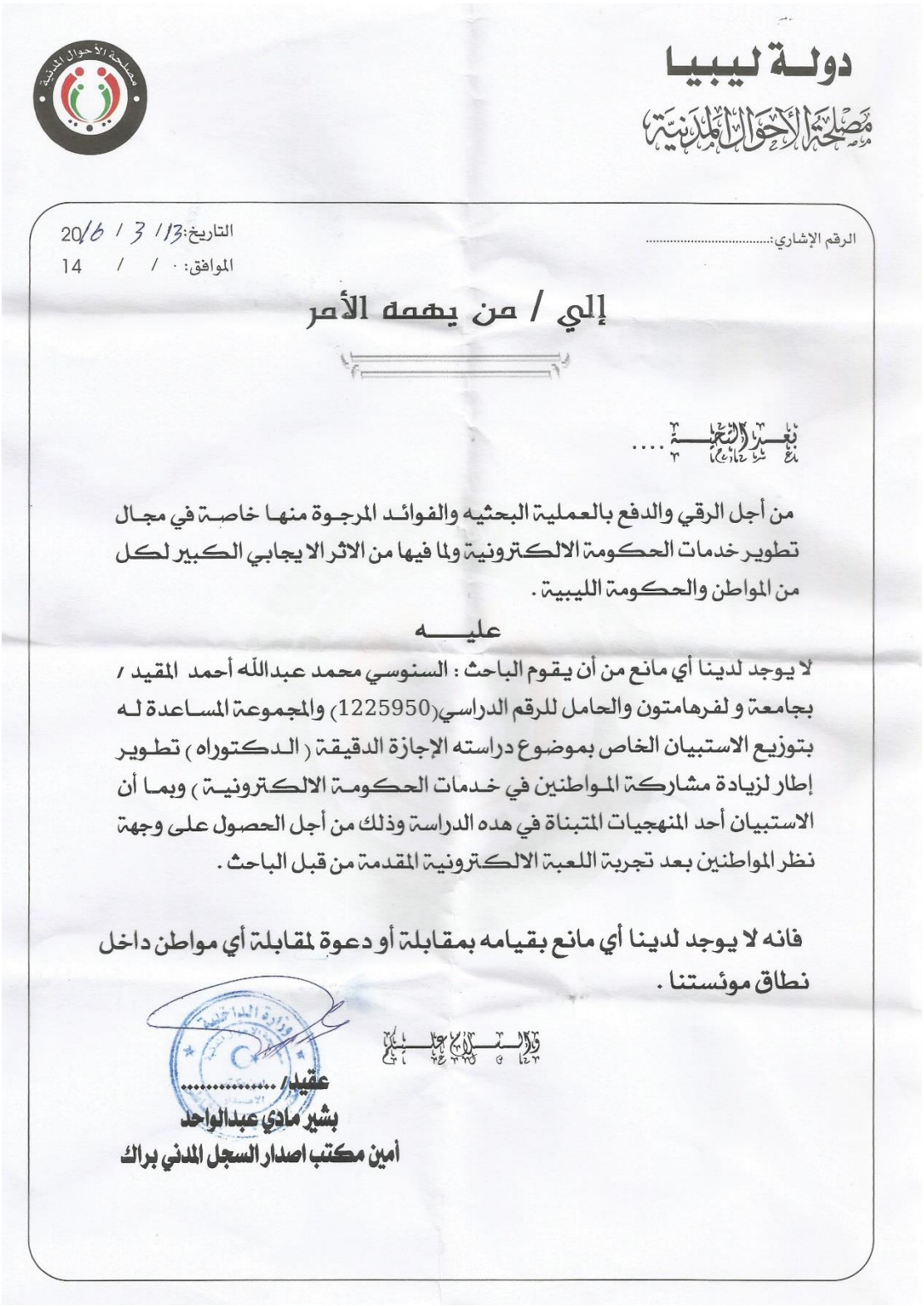
Appendix F: Permission to Access and Collect data



دولة ليبيا

مصلحة الأحوال المدنية

الرقم الإشاري:.....

التاريخ: 20/6 / 3 /13

الموافق: 14 / / ٠

إلي / من يهمه الأمر

بعد التحية ....

من أجل الرقي والدفع بالعملية البحثيه والفوائد المرجوة منها خاصة في مجال تطوير خدمات الحكومة الالكترونية ولما فيها من الاثر الا يجابي الكبير لكل من المواطن والحكومة الليبية .

عليه

لا يوجد لدينا أي مانع من أن يقوم الباحث : السنوسي محمد عبدالله أحمد المقيد / بجامعة و لفرهامتون والحامل للرقم الدراسي(1225950) والمجموعة المساعدة له بتوزيع الاستبيان الخاص بموضوع دراسته الإجازة الدقيقة (الدكتوراه) تطوير إطار لزيادة مشاركة المواطنين في خدمات الحكومة الالكترونية) وبما أن الاستبيان أحد المنهجيات المتبناة في هده الدراسة وذلك من أجل الحصول على وجهة نظر المواطنين بعد تجربة اللعبة الالكترونية المقدمة من قبل الباحث .

فانه لا يوجد لدينا أي مانع بقيامه بمقابلة أو دعوة لمقابلة أي مواطن داخل نطاق موئستنا .

والسلام عليكم

عقيد/ .....

بشير مادي عبدالواحد

أمين مكتب اصدار السجل المدني براك